

REPORT & PROPOSAL FOR THE
BEITKUL SEDASHEGUR &
BELLARY RAILWAY

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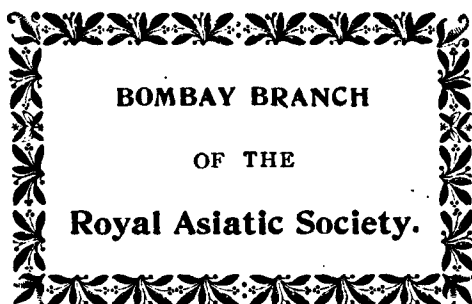


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REPORT AND PROPOSAL

FOR THE

BEITKUL, (SEDASHEGUR,)* DHARWAR,
AND BELLARY RAILWAY THROUGH
THE COTTON DISTRICTS.



It is a remarkable fact, that, in the desire to give to India the full advantages of the Railway system, to ensure greater political effect to the powers of the Government, as well as to extend the commercial prosperity of the country by giving improved outlets to immense tracts and populations, and by extending the influences of the more advanced and educated classes of the native society, that one of the most improved and important provinces of India (Dharwar) has been left, not only without the advantages of a Railway, but until lately without common roads; that the outlets to the coast for its immense and important products have been all but inaccessible, except at certain seasons of the year,

* Sedashegur Port and Railway will be called the Port of Beitkul and Beitkul Railway in this present paper.

either to the port of Koompta or the more important port of Beitkul or Sedashegur.

The object of the present paper, which I have the honour of your Excellency's permission to address to you, will I trust fully explain my proposed project for opening out the country from the port of Beitkul or Sedashegur through the district of North Canara, the Dharwar district through to its frontier, and through part of His Highness the Nizam's dominions, and into the Bellary district to the important town and cantonment of Bellary.

Such a line, if executed according to the present proposal, would give the advantages of improved communication to 18,000 square miles of territory, and meet the wants of over $3\frac{1}{4}$ millions of people in the districts passed through, according to the present rate of the population per square mile.

The present proposed line would at this point eventually join in with the Madras North-Western Railway, and the Great Indian and Peninsula line, thus giving communication to the southern presidency towns of the Madras presidency, along the south-west line from Madras to Beypoor on the western coast, and to Bangalore on the Bangalore branch. Trichinopoly, Tanjore, and the port of Negapatam would also be open to the present project by the Great Southern of India Railway from

Negapatam to Trichinopoly, and their junction with the Madras Railway at Errode near Salem.

The most important and peculiar advantages of the present project is, that it is proposed to construct the Railway without a guarantee from the Government, to avoid its complications and delays in construction, which have generally been attributed to its existence, as well as to institute a more economical system in the construction of Railways in this country, both in the substructure of the roadway itself, its permanent way, and necessary adjuncts in stations, buildings, rolling stock, &c.

I have admitted at the end of this paper, a description of the works, accompanied by a plan, which I should propose should be executed at the port of Beikul. The importance of some such work being immediately proceeded with, and the necessary accommodation provided for the shipment of the next season's crop of cotton and other commodities, cannot be overrated. At present the port is in its natural state, or what is worse, such small works that have been executed are of so impractical a character, and so useless to serve the purposes for which they were originally intended, as in the event of new and proper works being permitted to be proceeded with, the small dry stone walls built on the sand and called "wharf walls," and the narrow path-like roads, will have to be thrown down or removed.

At present, neither on the Beitkul nor on the east side of Beitkul Cove, is there a sufficient space to bring in carts or ship cotton into boats, the road from Beitkul along the east side of the Cove not being completed, or if completed, would not afford one thousandth part of the necessary accommodation required to ship nearly 50,000 tons of goods of the most bulky kind ; and unless the necessary accommodation is provided at Beitkul, I do not at present see what is to induce shippers to move from the inconvenient port of Koompta, that offers certainly the minimum amount of conveniences to trade, to Beitkul, that offers nothing, at least at present.

With a Railway from the rich and populous districts at the back of Sedashegur, there cannot be a doubt but that the harbour of Beitkul will become the port for the whole of the central portion of India, extending to the extreme of the Bellary district to the east, and to the Mysore country on the south-west,* it being the only deep water with safe anchorage that exists as a harbour on the western coast of India, with the exception of Bombay. The country about the bay of Sedashegur is also one of the most desirable places of location on the western coast. Its bay is capacious, deep, and picturesque.

* The 72 lacs of Rupees, left in the Treasury of Mysore by Sir Mark Cubbon, might be profitably spent in the construction of light Railways in that province, diverging towards the present proposed line at Hurryhur, making Beitkul the out-port for the NW. portion of Mysore.

On the south juts out far into the sea the bluff cliffs of Carwar Head, nearly 700 feet high, forming a perfectly secure retreat for shipping under its sides during the south-west monsoon. Outside the bay and directly west, the surf breaks against the three oyster rocks, upon one of which the proposed lighthouse is to be erected, while to the north-west and protecting the bay on that side are the green sides and bluff heads of the Deoghur and Cormaghur islands,* the splendid and broad river the “Cauly Nuddee” entering the bay just south of these, it having during the last year, in consequence of the increased force of the current overcoming the force of the prevailing south-west winds, and the natural head of water driven on the seaward side of the spit at its embouchure, driven through the spit in a direct line with the natural course of the river, instead of (as its course has been for the last fifty years) turning to the northward and making its exit into the sea under cover of the Deoghur and Cormaghur islands. This river is studded with islands of great beauty, and is navigable for boats and pattimars as far as Cadera, being about 23 miles, its average width being over half a mile; its channels are intricate and often narrow, though there is at all times sufficient water. Sedashegur hill and fort, and the old town, are on the north side of the

* Ships are secure under these during the N.W. winds.

river at its entrance. It is an old foundation of Sedashwa Row, one of the Rajas of Soonda, who grew into importance upon the overthrow of the great kingdom of Vijaganayar, at the battle of Talikote, in 1564. It is distant from Bombay 290 miles, and in Lat. $14^{\circ}52'$, Long. $74^{\circ}12'$.

The scenery of the lower and upper ghaut round Sedashegur is of the boldest description; the sides of the hills are everywhere covered with lofty forest trees and green verdure, while the peaks of Godhully and Golycodloo rise towering into the skies, range rises above range, melting away into the far distance, and the ever-changing light and flitting shadows give some of the most beautiful effects of scenery that can be imagined, while the resident at the port of Beitkul can find lofty and cool retreats 2,000 feet in height, for his family and himself within a short distance and of easy access from the port, or, during the monsoons, the Railway would take him to the garden-station of India, Dharwar, or the pleasant country about Hooblee on the upper level of the ghauts.

The general direction of the proposed Railway is to commence at the port of Beitkul, proceed by Yellapoor, Hooblee, Annigerree, Gudduck, Copul, Hospett, Tornagul, and Bellary, at which place would be the terminus of the present proposal. Station houses, and Goods accommodation should be

erected at these different places. The Cove of Beitkul is situated in the south-east angle of the bay of Sedashegur, the village of Koney being on the north of Beitkul, and separated from it by a rough spur of rocks coming down into the sea. Behind this spur from Koney, and in a confined *cul de sac* between this and the foot of another range of hills, coming down to the Cove of Beitkul, called Aliguddy, are the Manchester Cotton Company's works, now in the course of construction.

On the north of the village of Koney is the site I have selected as the best suited for a Railway terminus, and for serving the requirements of the harbour and its trade, and as suiting any other arrangements that may be made by the Government in laying and plotting out the land as a town round about it. The road from Sedashegur and Koodebaug to Beitkul would pass along its front. The whole of the land north of Beitkul and the range of hills is sand, liable to be altered from season to season by drifting, while in places along the shore and for a considerable extent, the natives have taken the timely precaution to plant trees to overcome the drift, and to prevent its overwhelming their wet cultivatable lands to the rear. The site selected is at present favourable and is of good level.

Prior to continuing this description, I may mention that the published ordinance maps give no

idea of the course of the mountain ranges in the Concan at this point, or along the river Cauly Nuddee from Sedashegur to the upper level of the ghauts. To enable me therefore to carry on my examination with any accuracy, I had to sketch the course of these ranges and their spurring down to the river at different points during my journey down.

From the proposed station the line should continue along the low ground to the south, being chiefly rice fields intersected by irrigating channels, passing to the north of Shagwand pagoda, and crossing a small nullah from one of the gorges of the hills to the south. After continuing a short distance through wet cultivation, the line would require to curve round to the north to cross the east branch of the Senkary or Carwar creek, and following the right bank of this creek up to the old town of Cadavaud. This town was once an important place of commerce, and the East India Company had a factory here in 1663, from which a contribution was levied in 1665 by Sevajee, the renowned founder of the Maratha sway. It fell into its present ruinous state during the time it was under the rule of Hyder Ali and his son Tippoo, who destroyed several thousand looms and sacrificed its inhabitants.

Continuing northward up to the Cauly Nuddee the line would have to curve round the termination of a low ridge, and would then proceed in side cutting

to traverse its side. This low ridge commences at Cadavaud and joins the high ridge near Umbazoog. After passing this it would arrive at the higher ridge spur jutting down to the river. The line would therefore have to bend back to cross the small river coming from the southern range by the village of Seedar. Crossing this it would curve round to its former direction and keep along the south bank of the river. This point is opposite the Hundcona and Hullagy creeks, situated on the right bank of the Cauly Nuddee to the north.

The line would now pass the village of Kindar to the north, and, working round the *cul de sac* in which this village and its cultivation is situated, would again bend towards the river to pass over at as low a point as possible another ridge that comes down to it; this would be a short stiff cutting through rock, the village of Seedur (not Sedoor marked in the ordinance map) being at the bottom of the eastern slope of this ridge. After overcoming this, the line has again to bend towards the land from the river to get over Cargy creek, an important stream rising at some distance in the hills to the south. The bending back at this point is also necessary to keep the high level of the land. The village of Cargy is on the south-eastern side of the creek, to the south of which the line would have to be taken. After passing this point, the line

should again turn towards the river to meet the most formidable obstacle between the port and Mallapoor, this being Cargy droog, a high, stiff, and precipitous ridge that comes jutting down to the river. I do not at present think that a tunnel would require to be constructed, and, by keeping the level of the rail as high as possible from the starting point, such a work may possibly be avoided; but it would involve a very heavy and hard cutting in any case. Passing this difficulty, the line should again be kept back to maintain the rising gradient, without involving any heavy works. We now come to a long low ridge running north and south, the Cauly Nuddee bending northwards at this point for about two and a half miles, and then turning to the eastward again. This place is at about ten miles from Sedashegur up the river. On the western slope up the ridge just mentioned is the village of Kerravuddy. After passing this, and keeping back for the reasons I have stated, and crossing the point of the bend of the Cauly Nuddee, the line meets another obstacle by another spur coming down; this spur running inward a short distance joins its parent ridge, which also comes down to meet the line. Beyond this point we come to the village of Bolayy, which is in the eastern slope of this spur. This is the last ridge, and is directly opposite the west end of the island in the river below Mallapoor.

The portion of the line up to this point (Mallapoor) being twenty miles from the port, I should consider as the first section of the proposed works, consisting of a constantly curving line, rendered necessary, to overcome the many spurs of the hills that jut out from the southern range running from east to west. Such a line would of necessity have some heavy works in side cutting, embankment, retaining walls, and bridging, with sharp curves, the least of which, would probably not be less than 10 chains radius. But though these works would be extensive of their kind, they would be limited in character as compared with similar works either on the Bhoire or the Thull Ghaut, and would not be found to be difficulties either of a serious or a costly nature. The geological character of the hills generally below the ghauts is a loose schistose clayey slate, mixed with large portions of laterite. Under this, and prior to getting the works of the Railway down to the formation level, some hard rock would most probably be found.

Laterite is used as the building material at Sedashegur, Senkary, and the old town of Cadavand. It is cut and sold at a rate per hundred in blocks, averaging 2 feet $\times$ 10 inches $\times$ 6 inches. It is a vesicular iron-stone similar to the laterite of the eastern coast, but contains less iron oxide, or binding matter, and an excess of clay.

It is therefore soft and perishable when exposed to the atmosphere.

From Mallapoor to Koodasully and Barbully at the foot of the ghauts, which I call the second portion of my examination, there does not exist the slightest difficulty to Railway construction, with the exception of the works being through dense jungles, and the difficulties attendant upon the obtaining of labourers, and prevailing upon the latter to locate themselves in the villages, and warrees, adjacent to the works. There are no spurs reaching the river from the southern range of hills, which keep back from it from one to three miles for the whole distance.

The peculiarity of the river at this point is the overflowing its banks during the monsoon, caused by continued heavy rains in the upper country bringing down the river at increased flood and meeting the tidal river at Mallapoor, throwing the waters backward and over the banks of the river on the south side to the depths of 10 and 12 feet. In consequence of this periodical occurrence, the line of Railway would have to be thrown back from Mallapoor nearer to the hills between Mallapoor and Koodasully, passing behind the villages of Koneypett, Hummagudda, Moordee (at the foot of the Kygah ghaut), Sengerakerry, Hebacooly, and Devacour. *Crossing a little rough ground for a short distance towards Koodasully and on to the

village of Barbully, there is a small ridge of hard basaltic rock jutting down upon the direction of the line west of Koodasully, which would necessitate cutting through, but would not, I imagine, exceed two hundred or two hundred and fifty yards in length, and of no great depth.

The soil between Mullapoor and this point is chiefly red, and laterite can be obtained the whole of the distance.

The rivers are generally small ; those at Hummagudda and Sengerakerry not being more than from one to two chains wide ; while the river at Barbully, which is the largest in this length, would require bridging to the extent of 4 or 5 chains.

Having in my description of the proposed Railway reached the foot of the ghauts at Barbully, it is necessary that I should go back in my description to Beitkul, to describe another line that takes a more direct course, but which would involve very heavy tunnel works through the high saddle about 800 feet high, to the south-east of the old town of Cadavaud. The hills in this direction take the form of the letter **II**, the bottom portion of the letter being the southern range running direct east from Beitkul, the peaks of Godhully and Golycodloo being their summits, while the termination of the right and left arms of the upper portion of the letter

represent two of the spurs which I have already described. The line at present described would run through the saddle about two-thirds of the way down the shaft of the letter from the cross head, and would be directly east from the proposed terminus north of Koney. Not having had the opportunity of sectioning this portion, it would be nearly impossible to give any precise information as to the probable length of the tunnel required to surmount this difficulty; but judging from the natural features of the country on both sides of the saddle, I should not imagine that it could be more than one mile in length. The geological character of the saddle is a compact sandstone, with loose schistose clayey slate intermixed.

After leaving the tunnel, the line would have to proceed through a gullet of the hills to the north of the villages of Balloor and Burgall, behind Cargy and Cargy Droog; and, crossing the Cargy creek about one mile and a half above the former crossing, which I have already described, it would then enter the jungles and pass behind the long ridge running north and south at Kerrawuddy, and, coming up to the last spur that juts on to the Cauly Nuddee, would join the former proposed line.

The advantage of this proposition is its direct course from the terminus to the last spur on the river, a distance of about 18 miles, and a saving in

distance of two miles in direction ; though the undertaking this route in preference to the more open though a longer one, would involve a much greater responsibility and expenditure, in working through the tunnel, and the more serious loss of time, which is most material in the construction of this line of railway.

The direction of this route may, however, be found to deserve still further examination than I have been able to give to it ; but so far as I have been able to examine it, I should not give it the preference over the more open line along the river, which, though two miles longer, could, I am satisfied, be executed at a more economical cost and in less time than the shorter and heavier route.

Before describing the Railway up the ghaut, along the course discovered as the best suited for the construction of a railway, it will, I think, be advisable to describe the present ghaut roads as I found them in my examination of the different lines during my stay at Yellapoor for this purpose.

In the formation of any one of the roads in these ghauts, the task of discovering a desirable trace must have been a most difficult and arduous undertaking, requiring great skill and experience, owing to the denseness of the forests and the difficulty of obtaining any information as to the conform-

ation of the main lines of the ranges, and ridges running out from them. The villages are few in number, and the few clearings that there are are chiefly occupied by Maratha Bramins, who are timid, and suspicious that any inquiries that may be made may have more reference to the revenue settlements of the lands they have occupied, than the actual formation of a road. The ghaut roads are at present three in number: the Ganaja Goode ghaut, the Kygah ghaut, and the Arbyle ghaut.

The Ganaja Goode Ghaut.

The line of this ghaut is simply a bullock track, though at one period, and prior to the Kygah ghaut being opened, it was the only practicable road from this point (Yellapoor) down to the low country. The line proceeds nearly direct west from Yellapoor, along a most difficult path, and continuing to cross or wind round the low hills at the top of the ghaut for nine miles to Ganaja Goode, being a small clearing, pagoda, and police tannah, at the top of the descent. The difficulties of the road, and the liability to lose the direct path in reaching Ganaja Goode, make this short distance of nine miles nearly a day's journey both for cattle and the coolies required to carry baggage. The few travellers that make use of this old road at the present time generally halt in the temple at Ganaja Goode for security to themselves, their cattle, and property.

The descent of the ghaut commences immediately on leaving the temple of Ganaja Goode, and is completed to its foot in a direct distance of $3\frac{1}{2}$ miles, the height being nearly 1,500 feet would give a descent of about 428 feet in the mile. The track is one of the most difficult that could possibly be imagined. For some distance it proceeds down a rocky bed of boulders, with sudden falls from 3 to 6 feet in depth, and often at an inclination of 1 to 1; it then traverses along the top of a herring-bone ridge, with the Cauly Nuddee rolling and roaring in its course several hundreds of feet below on the right, while the left descends with a fearful declivity into a deep and dark sholah, full of close jungle and towering forest trees. It then leaves the close vicinity of the river, and across several stiff ridges makes again a steep, winding, and sudden descent, which brings the track again close to the Cauly Nuddee, and at the bottom of the ghaut to the Barbully river.

The peculiar formation of this ghaut,—its object being, like all other native tracks of a similar kind, to obtain the greatest descent in the shortest possible distance,—and its close contiguity on the one side to the Cauly Nuddee, and the deep gorges on the other, render its present course or its vicinity altogether unfit for the construction of a railway, owing to the want of distance to extend the descent,

to enable proper and workable gradients being obtained.

The commission appointed by the Bombay Government in 1856, to report upon the capabilities and resources of North Canara and Sedashegur, recommended, I believe, that this road and the ghauts adjacent should be resurveyed, and a road constructed in its vicinity in preference to the Kygah road, then about to be constructed. This recommendation was not however adopted, and the road by Kygah was then proceeded with.

Below the ghaut of Ganaja Goode towards the coast there does not exist any definite road or track along which traffic can proceed, a different track being made each season; while during the monsoon, as before mentioned, between the foot of the ghauts and Mallapoor the river often overflows its banks, covering the fair weather track to the depth of several feet.

From Mallapoor, the river is the usual way in which travellers and their goods reach Sedashegur, the road being very bad and tortuous, amongst the hills and in thick jungle, making this portion, a distance of 20 miles, a two days' journey.

The Kygah Ghaut.

The construction of this ghaut bears a very great resemblance to the Ganaja Goode ghaut, though

executed under entirely different principles to those which must have guided the selection of the former road. The Kygah ghaut may be called a high level road, it being the principle of the talented Engineer who produced this trace, to keep the high level of the country as far as possible before commencing the descent,—one of the chief reasons for the adoption of such a road system being, to avoid as much as possible all cultivated areas, and to keep in all cases the road above them, and also to avoid all heavy masonry works by keeping the road crossings nearer to the sources of the mountain streams, which would demand only the minimum amount of masonry work to be executed in culverts and bridges required to cross them; but as the Madras Public Works Department seldom or never built permanent masonry works in their ghaut lines, the road was sacrificed to a principle, that might only have been good if the works were rendered permanent by masonry bridges. A few trunks of trees, a few bundles of grass and sticks, with a mud covering, is the general result of Madras engineering upon many such and similar roads in the Madras presidency.

The direction of this road proceeds in a south-west course from Yellapoor to Iddagoonta, a mile beyond which is the junction of the Arbyle ghaut; this latter proceeding directly south, while the Kygah, running west south-west, keeps the high

level of the ghauts, and crossing a very high saddle, passes Vasula, and goes on to Bahray at the head of the ghaut, and 1,600 feet above the village of Kygah at its base, so that something like 20 miles in distance has been accomplished without obtaining any of the advantages of descent. It appears like a timid huntsman at a fence and ditch, craning over to see his difficulties beyond. The high level of the country has here been kept for 20 miles as far as it was possible, till in a similar manner you can crane over and see Kygah at its base 1,600 feet below in a direct distance of $4\frac{1}{2}$ miles. The result of such an injudicious selection of route, and the carrying out the principle of high level ghaut roads, has been a road extending in $4\frac{1}{2}$ miles direct distance to $13\frac{1}{2}$ miles of roadway, with very steep gradients, some of which are 1 in 16, and several reversing or zig-zag roads, continuing for some distance along the sides of the hills to overcome the difficulties of the descent, that might have been avoided if the principle could only have been permitted to be sacrificed for the good of the cart traffic and the traveller, as there is no reason why the road in reaching the distance in miles as far as Bahray should not have been at least from 3 to 400 feet below it.

This road is at present in a very uncertain and unsatisfactory state, owing in some places to the stiff inclinations upon which the side cuttings are

made, the small extent of solid roadway in these, and the liability to slips carrying away the outside or artificial roadway, combined with the steep gradients and increased mileage in distance to be overcome to obtain the descent. The road is continued close by the village of Kygah and on to Moordee; it then disappears, as I could not find any trace of it whatever between this point and Mallapoor *via* Koneypett, a distance of more than five miles.

It would certainly be a question worthy of the consideration of the Government, now that it is determined to construct a line of Railway, (and which may be constructed under the present proposed route and conditions,) whether it is advisable to enter on any further expenditure to nearly remake this road after the present monsoons.*

But to provide for the traffic of the country down to the coast during the period the Railway is constructing, the Railway Company should be empowered to make a good temporary road from Mallapoor, the bundar on the Cauly Nuddee, up the ghauts, alongside the Railway trace as far as Yellapoor, joining the new road just completed through

* I have just learnt from Sedashegur, that no works have yet been commenced on this road, and that it is much feared that another year will be lost, causing considerable and serious loss to those who have invested capital and made arrangements in anticipation that shipments could have been made from Beitkul during the next season.

to that place. And as this road will only be required for a limited period of time, will be a shorter and more direct route than the Kygah, the Government might safely entrust the Railway Company with the construction of this road at the Government expense ; the object of such a proposal being to give the cartmen an opportunity of obtaining a back traffic along the line of Railway. It would therefore be to the interests of both the Railway Company and the Government, that the road be kept open as serving both the Government, the people of the district, and the Railway. It would also have the advantage of continued personal inspection by the Engineering staff of the Company.

The Railway being permitted to construct the road for the Government, should, after being completed, be repaired by the Railway Company. Upon the completion of the Railway to Yellapoor it should then be handed back to Government, to be kept open if it should be considered desirable that the people of the districts should have a public road as well as the Railway down the ghauts ; it would at all times be useful as a local road.

In comparing this proposal with the present unsatisfactory condition of the Kygah road, there cannot be a doubt but that the advantages are in favor of a new road alongside the line of Railway, and concentrating a portion of the cotton carted from the

interior down this road to Mallapoor, the rest going by the Arbyle and the Hydragah ghauts to Beitzkul. This would relieve the confined space of Beitzkul, and would at once form the nucleus of a boat trade on the river, by the Railway Company's stores, which would be conveyed from the port up the river by boats or barges to a depôt at Mallapoor; these boats or barges would convey the cotton down the river at a fixed rate per ton, through, from the district to the port; the cartmen bringing cotton to Mallapoor would then obtain return loads for their carts of Railway materials, stores, &c. to be delivered at the different districts and places along the line of Railway.

Should such a proposition as this meet with the favorable consideration of the Government, and the Railway Company be by them entrusted with the execution of this road, it would clearly be to the interests of the Railway Company to have the works of the road rapidly and properly executed, to enable them to obtain stores and materials along the line at an early period; and the wishes of the Government would at the same time be met, by the people of the cotton producing districts possessing a good and at all times an open road for the conveyance of their commodities down to the coast.

With reference to the Kygah ghaut for the purposes of a Railway, it is quite clear from the nature

of the high country continuing to so great a distance to the commencement of the descent, that it is altogether unfit, nor could I observe any openings in its vicinity that a Railway could be got down; and as it was a work of many years and one of immense difficulty to obtain the present trace of the road, I abandoned further examination of that portion of the ghaut for the proposed line of Railway.

The Arbyle Ghaut.

As this ghaut traverses southward from Iddagoonta and afterwards in a south-west direction along the banks of the Gungawully river by Soonkasola to Unkola, it is altogether out of the direction of any proposed line to reach the port of Beikul by a railway. This ghaut road is, however, in very good order as far as Unkola; its gradients are in some places less than 1 in 16, and with sharp curves. It is at present the principal cotton road, and cartmen, I am assured, will at all times prefer this route to the Kygah, owing I believe to the better opportunities it gives them to obtain grass and water for their cattle. The road being complete as far as Unkola, it requires only the road from Unkola to Beikul by the Hydraghat to be completed with bridges either of a permanent or temporary kind (the latter being the best, as they could be completed for next season's crop,) over the Unkola and

Ballakerry creeks, instead of bending the road back to some considerable distance, to obtain a ford and save the erection of a temporary bridge, the construction of which latter should be ordered to be executed at once. It could not be a work of any difficulty in driving a pile timber bridge, similar to those erected over the nullahs at Kooresoor and Nalowdee in the Dharwar district by Captain Playfair; such a structure would at least last from 15 to 20 years—a period of time quite long enough to warrant such a construction to be proceeded with. It would, I venture to state, be at once unwise to maintain the road in its present inconvenient position, at fords that are likely, in the event of a sudden fall of rain in the ghauts to be stopped, and thus subject the cartmen to the exactions of the boat-owners on the creek, besides the great inconvenience of twice breaking bulk of the commodity during its transit over ten miles of road.

Having described the different ghaut routes that have been adopted by the Government of Madras for the construction of public roads, and the course they pursue over the ghaut ranges, it appears singular that the route marked by the natural course of the river from Barbully on the Cauly Nuddee has never at any time had a trace run through it, considering that it so favourably marks a course from its embouchure at the Cauly Nuddee up its

source, a little to the south-west of Yellapoor; and it was only after examining carefully the existing roads down the ghauts and the ranges in their vicinity, that I finally determined to strike a direct line W. by S. along the course of this river from Yellapoor through the jungles, and if possible (it being in the middle of the south-west monsoon) reach the Cauly Nuddee at Barbully. This 10 miles' journey occupied two days, the jungles being very dense, coupled with the difficulties of descending steep declivities, and getting over torrents that were filled in consequence of the daily downpour of heavy rains, and in keeping the fever-stricken coolies up to the march with my baggage. The examination, though attended with so many difficulties and discomfort, fully repaid the adventure, as it enabled me to discover that what nature had provided in the small river from Yellapoor to the Cauly Nuddee was the only proper and easy way for the descent by a railway, and which I will now attempt to describe.

The works required to be done between Beitkul and Mallapoor though heavy cannot be described as ghaut works; it is therefore not till the line reaches Barbully that the actual ascent from the low to the high country commences, and which can be designated as ghaut construction. The distance in a direct line from the village of Barbully to the

village of Yellapoor is $10\frac{1}{2}$ miles, but the course of the intended line along this route would most probably be extended to 15 miles, by having to curve the line back in some places to avoid heavy works, and to get the roadway round the terminations of the long and low ridges that come down to the Barbully river on the north side.

From careful observations taken by the Aneroid barometer, I made the difference of level between Yellapoor and Barbully at the foot of the ghauts to be 1,575 feet. This would give (supposing the line to be extended in distance to 15 miles) 105 feet per mile, and judging by the close examination I made of this portion of my duty, I consider that the line could be easily constructed at this rate of fall per mile, the equable gradient being 1 in $50\cdot28$; and I should also consider that, after the ghauts have been carefully surveyed and accurate sections and cross sections obtained, it would be found that a favourable line could be adopted with none of the gradients stiffer than 1 in 50. With such a favourable result as this down the ghaut, it will, I think, bear comparison with the Bhore or the Thull ghauts, whose quickest gradient is I believe 1 in 37, with many at 1 in 40.

Another advantage of the present route would be, that the work could be executed without incurring any very heavy works either in embankments or

cuttings, and judging from the shallowness of the gorges between the spurs, and the smallness of the tributaries or gulleets descending the sides of the hills, no very extensive masonry structures would be required that would demand a considerable period of time for their construction, or a heavy expenditure. The course of the river from Barbully to Yellapoor marks it as the natural course for any roadway from the low to the high level, the river bottom for half its distance down from Yellapoor consisting of clearings of sopari gardens and rice fields, through and over which the water is permitted to flow, fully proving that the river does not possess any great force or velocity that would injure rice crops or garden trees. The ryots allow it to go through and over their cultivation until its volume is increased by the small tributaries on each side of it, when it is turned off from the gardens and fields by deeply excavated nullahs; it then forms a natural river bed, and enters the Cauly Nuddee about half a mile north of the village of Barbully. The proposed Railway should cross this river to the north side, in consequence of some heavy bluff ridges that come down to the river behind the village of Barbully, and after crossing it, should curve round to the east, and passing the spur that comes down to it at the second small tributary, from its junction with the Cauly Nuddee; it would then have to bend back and northward, crossing rather

a heavy bottom, and the third tributary, would continue alongside the ridge that again approaches the river at this point. To the north-east of this is the commencement of another line of hills running from the river in the shape of the letter **V**, and it is at this position on the ghaut that I imagine the heaviest portion of the ghaut work would have to be undertaken, and the steepest gradients incurred.

Having reached and surmounted the difficulties presented at this point of the intended Railway, it would, I imagine, be desirable to recross the Barbully river and keep the south side for some short distance, when, as the stream narrows considerably and becomes unimportant, even during the monsoon, the line should regain the right bank by again being bridged, and the summit gained in about $2\frac{1}{2}$ or 3 miles at Yellapoor; thus making the total distance from this place to the port of Beitkul about 53 miles.

Yellapoor is not a large or a populous town, though it is the cusbah town of the talook, and is a centre to which the principal cotton roads of the district converge, and which will, during the course of next year, rise in importance, owing to the completion of the new cotton road from Hooblee *via* Kulghutgee and Kirwutty. The cotton passing through Yellapoor will then be taken down the

Arbyle ghaut to Beitkul, *viâ* Unkola and the Hydragah ghaut.

Yellapoor is inhabited by Maratha Brahmins, who are chiefly servants of the Government employed in the Tahsildar's cutcherry, or cultivators of small clearings and sopari gardens in the jungles adjacent to the village; it is in Lat. $14^{\circ} 58'$, Long. $74^{\circ} 46'$.

From Yellapoor the line of Railway should proceed along the water-shed of this portion of the district to Kirwutty, a distance of 12 miles. This water-shed is between the Tutihal nullah to the north-west and the Baidlee nullah on the south-east. There is a small nullah that would require to be crossed a little to the north of the village of Yellapoor. The soil throughout this portion is black and red intermixed, with blue basaltic stone and laterite. Chunam or limestone is found at some distance from Yellapoor. The features of the country are undulating jungles, and is not unfavourable to a good line of Railway being obtained. The general direction should be north-east, keeping the country adjacent to the new public road, passing the large tank at Davykop to the north-west, and reaching the large village of Kulghutgee to the south-east. The jungle terminates at Davykop, and at this point the line would reach the open and cultivated country, which would give about 73

miles of jungle clearing from the proposed terminus at the port of Beitkul.

From Kulghutgee the line should still be continued in a north-east direction, passing Misrekota close to the south-east and along the south-east side of the Bhowunder range of hills, and up to the large and important towns of Old and New Hooblee, passing between these and the village of Bidnal on the Koondgal road.

These two old towns of Old and New Hooblee (now one) are 12 miles to the south-east of Dharwar, and though not very well built, it is a thriving place, and possesses nearly the whole of the cotton and other trade of the district of Dharwar at its back ; it is considered the principal mart of the whole of the Southern Maratha Country, and in this respect there cannot be a doubt but that, with such an improved means of communication as a railway to the interior of the country on the one side and the outport on the other, its importance in this respect will be very considerably increased. There is a good road to the chief town of Dharwar, which was completed some years ago. Old Hooblee was formerly the seat of an English factory in 1673, which was with the rest of the town plundered by Sevajee, the Maratha leader, to the amount of 7,894 pagodas. Moazzim, son of Arungzebe, was sent by his father into this country at the head of an army and took Hooblee,

but during the decline of the king of Dehli, it again fell into the power of the Marathas, and on the overthrow of the Peishwa was, with the rest of that prince's dominions, taken possession of by the British; it is distant from Bombay SE 290 miles, Poona SE 230 miles. Lat. $15^{\circ} 20'$, Long. $75^{\circ} 13'$.

The general feature of the district from Kulghutgee to Hooblee is a long rough undulating country of red soil, the bottoms being generally swampy and having rice cultivation; the substructure is a schistose diallage of red and blue clayey slate, with faults filled in with decomposed limestone.

As Hooblee would be one of the great centres of traffic on the proposed Railway, and being favourable to health, and the obtaining of supplies for any large body of workmen that might be located here, I should propose that the chief station, goods and store sheds, head offices, and locomotive workshops, should be at this place; more especially as, in the present proposal, the heavy ghaut rail of 80 lbs. to the yard would be continued as far as Hooblee, and the light rail carried forward across the plains of Dharwar, and through the Bellary district to Bellary; and by having the locomotive shops, &c. here, the heavier class engines could work the traffic from and to the port of Beikul,

while the lighter class engines would convey the same trains over the plains and along the easier grades.

With the exception of the village of Kulghutgee, which is feverish, owing to its close vicinity to the jungles, and the difficulties of obtaining any kind of supplies, Hooblee is the only place where the head offices and locomotive shops can be located with convenience along the proposed line of Railway.

Upon leaving the large and important town of Hooblee, the line would at once come upon the cotton plains of the Collectorate of Dharwar, and run in an east by north direction along a water-shed till it reached the Bedee nullah, at the village of Nalow-dee, which latter is situated on the east bank. From this point, and after crossing the nullah, the direction should be east north-east, crossing another small nullah at Budrapoor, and proceeding to the large village of Anigerree, one of the principal centres of the cotton trade. The soil from Hooblee is all black, overlying decomposed limestone at a probable average depth of two feet.

From Anigerree, the line and station being to the south, should continue in a direct easterly course to the south side of the old fort at Gudduck. Crossing a few unimportant nullahs, the country from Anigerree is still a cotton plain, but gently undulating, the ridge portions being generally a red and stony soil,

overlying a clayey schist, while the lower portions are of black soil, overlying, as in nearly all cases it does, the rotten kunker or decomposed limestone. As no roads of any kind have been completed in this portion of the district,* the natives generally use the hard bottoms of the nullahs and water-courses for their roads; and in some of these I found laterite cropping out, and covering sandstone rock.

The village of Anigerree is 20 miles from Hooblee, making it 113 miles from the port, while Gudduck is 12 miles from Anigerree, making it 125 miles from the outport at Beitkul.

Gudduck has been for some time the principal cotton mart on this side of the Dharwar district, and it is here as well as at Anigerree and Dumbul, that the noise of the fly-wheel and the cotton gin are heard as you proceed along their streets, while they have the great cotton-producing districts of Koondgul, Nowlgoond, and Nurgoond adjacent to them.

From Gudduck, the proposed Railway should curve round and follow a south-east by east direction to the town of Dumbul, passing it closely on the north-east side to avoid a large tank, and the works of the weir constructing by the D. P. W. across the large nullah adjacent to the town.

* A new road has been staked out and partially banked up with the black soil in some places.

Dumbul is a large and busy village, and is the last important place in the Collectorate of Dharwar. On the intended line of Railway it is 12 miles from Gudduck, making it 137 miles from the outport of Beitkul ; the soil is chiefly red, but intermixed with black ; the country gently undulating and favourable to Railway construction ; stone in abundance can be procured from the range of hills lying close to the intended line to the south-west. There are no nullahs of any importance that would require to be crossed.

From Dumbul the proposed railway should proceed direct east, crossing the Dharwar frontier and entering His Highness the Nizam's dominions at $7\frac{3}{4}$ miles from Dumbul, and proceeding onward to the large village of Coworoor, passing it to the north, and continuing the same course to the town of Copul, keeping the line about 2 miles to the south, in consequence of there being a series of rocky boulder ridges ; and for the same reasons Bahadoor Bunda should be kept well to the north, about $\frac{3}{4}$ of a mile. The soil from Dumbul is all red, with boulder rocks cropping out of all the ridges of the undulations of the country. There would be the Copul river to cross about 3 miles west of the town of Copul, and which is about 3 chains wide.

Copul is a large irregular built town with extensive fortifications, and is reputed to be a place of considerable trade ; it is 51 miles west of ~~Dharwar~~

and 78 miles east from Dharwar; it is the cusbal town of His Highness the Nizam's dominions to the south of the Raichore Doab, the country passed through being the jaghire of His Excellency Salar Jung, the Nizam's minister at Hyderabad.

The village of Coworoor is 11 miles from Dumbul, making it 148 miles from the sea, while the town of Copul is 14 miles from Coworoor, making this point 162 miles from the port of Beikul.

From Copul the direction of the Railway should be turned to east by south, continuing down to the proposed crossing of the Tungabudra river at Honoor Mully, being 12 miles from Copul to the left bank of this river, which is the frontier of His Highness the Nizam's dominion, and after crossing the Tungabudra, the Collectorate of Bellary in the Madras Presidency is entered. Following the course described for the proposed line, there would be $29\frac{1}{2}$ miles through His Highness the Nizam's dominions, the necessary permission to construct works through it requiring to be obtained from Hyderabad; but as His Highness the Nizam is at present favourable to such communications, no difficulties would be experienced in obtaining the desired grant of land, on the same basis as the negotiations with the Bombay Government.

The crossing of the Tungabudra river being the only important bridge along the whole length of the proposed Railway, I spent some considerable

time upon the selection of the best point of crossing for a Railway bridge; and from the examination of several sites, have selected the present one at Honoor Mully for description, as the best both for direction, the minimum strength or velocity of the river, and the advantage of having a stone quarry upon the island in the centre of the river, that would supply the material without much carriage for the bridge piers on each side of it.

The proposed crossing is at the island opposite to Honoor Mully on the left bank and the village of Beppakungoondy on the right bank, crossing one branch of the river on to the north end of the island, and after a small embankment crossing another small branch to the Bellary side. The river at this point flows from south to north, while the course of the Railway would be east by south.

The width of the western branch is $19\frac{1}{2}$ chains, while the width of the eastern stream is only $4\frac{1}{2}$, making 24 chains of bridging. The ordinary floods do not cover more than one-third of this entire width, and probably when correct sections are taken across this river, it would be found that it would not require to be bridged to the full extent of 24 chains; the provision would have to be made to meet extraordinary floods which at different and uncertain periods generally occur in Indian rivers.

The total width from east to west, including the portion of the island, which is 18 chains, would be

42 chains; the point selected being 10 chains from the southern extremity of the island, this point commencing on a favourable rocky ridge about 5 feet above the present surface of the stream, succeeded by drift sand at a somewhat lower elevation. From this the surface of the ground gradually assumes a firmer texture up to the proposed crossing at 220 lineal yards into the island, where it reaches the maximum height of that part of it. Some portion of the southern end of the island must be submerged at high floods, but they can never reach the proposed line of Railway. With the exception of a small portion of the southern extremity, the island is composed of stiff red clay, while towards the north end it becomes rocky; and it is at this point of the island that a good stone quarry can be obtained, the stone being a compact trappic rock.

The greatest elevation of the island is probably 30 or 40 feet above the bed of the river.

The bed of the eastern branch is lower than the western; the eastern bank being well defined, consisting of stiff clay and mud, while the bank on the west side slopes upward on to the general level of the land, and is not so well defined. The course of the river is however well marked, being composed of firm earth, mixed with limestone, gravel, and small boulders.

The eastern and western margins of the island are steep ; the eastern being hard and generally drifted up its side with drift sand, while the western is almost perpendicular.

The bed of the eastern branch has a quick descent, the bottom being rocky and covered to the depth of 2 and 3 feet with drift sand and gravel. The western stream is not so quick in its velocity, and has also a rocky bed, with the rocks cropping out in jagged points at different places across the river.

From the right bank of the Tungabudra river, the line should proceed to the northern side of the large and populous town of Hospett, a place of considerable trade, the cusbah town of the Talook, and Head Quarters of the Head Assistant Collector of Bellary. The chief trade of Hospett is in metal working and brass founding. The adjacent town of Chitwaddy is another important entrepôt in this part of the country.

The station at Hospett would also be the nearest to the famous temples of Humpy, and the ruins of the Beejnuggur kings, to which place the whole of the native Hindoo population for two and three hundred miles round their centre make their pilgrimages.

Hospett would be 16 miles from the proposed station at Copul, and would be 178 miles from the Port of Beikul. The soil is generally black and red intermixed, overlying kunker, and there is limestone and stone for building purposes in abundance.

From Hospett the proposed line should proceed in an east by south direction, entering the full cultivated valley between the Yettenhutti range of hills to the south and the Darojee range to the north, passing close to Karriganoor, and crossing the nullah close to this village, following the public road by Wudgera, Durmasagur, Gadejanoor, to Kooreekoompta, at which place a river about 5 chains wide would require to be crossed, it being one of the principal feeders to the large tank of Darojee, a large and important place of trade.

At Tornagul, $2\frac{1}{2}$ miles further east, a station should be erected, with a road to the important town of Darojee. This station would be at the junction of the public road leading to the Raman-droog Hills, now a place of some importance as a sanatorium for European troops; it is also the hill station for Bellary and Secundrabad.

The station at Tornagul would be 20 miles from Hospett and 198 miles from Beitkul. The country is very favourable to economical Railway construction, the soil altogether red; the range of hills on each side are of gniess, with extensive trap rock dykes running through them from east to west; there are also some singular tufatic vents along the base of these hills, causing mounds of pumice that might be useful in forming Hydraulic limes for the works of the Tungabudra bridge. Nodular

limestone is abundant in this part of the district, but with the disadvantage of a scarcity of fuel.

From Tornagul the line should continue in the same direction on to Bellary, passing the village of Koodatunny to the south and running to the north side of the Bellary rocks on to the red soil, sloping down from the north-western boulder ridge below the church, and in the large and extensive tope near to "Maxwell's Garden" and north of the large well, known as "the dancing girls' bourie." This is the best site for the terminus of the proposed Railway in or about the town of Bellary, as serving conveniently, and commercially, the large bazaars and traders in Cowl bazaar and Bruce pettah; it would also be on the right side of Bellary as best suiting the military conveniences of the cantonment; it is also on the public road of the whole of the cotton traffic from the northern portion of the Zillah of Bellary, including the Bellary, Adwani, Davunkonda, and Naguldinny talooks; and I imagine, and there can hardly be any doubt, but that with a line of Railway completed from the western port of Beitkul, the whole of the cotton from the western talooks of the Zillah of Cuddapah would be drawn to the proposed outport.

Bellary would be 16 miles from the proposed station at Tornagul, making this terminus 214 miles or thereabouts from the port of Beitkul. The soil from

Tornagul is red and black intermixed, building stone can be obtained from the range of hills to the south, and from the boulder rocks at Bellary, limestone is everywhere abundant, but fuel is scarce and dear.

Having now described the whole of the line, as intended in the present proposal, from the Port of Beitkul to Bellary, with reference to its direction, distances, and the nature of the country proposed to be passed through, it remains to mention some of the general characteristics of the different portions of the undertaking, that will require to be so constructed as to meet effectually the different conditions of the climate, more especially with reference to the rain-fall in the districts passed through, the maximum fall on the western ghauts and below through the Concan to the seaboard, the partial fall from Dharwar eastward, and the uncertain fall, and oftentimes a total absence of any periodical or regular rains in the Bellary District.

Firstly, the Line through Concan from the Port of Beitkul to Barbully the foot of the Ghauts.— From an enlarged manuscript map of North Canara, in the possession of Major Anderson, of the Revenue Survey, showing the Cauly Nuddee and the mountain ranges on each side of it, would appear that the characteristics of this portion of the proposed line up to Bolavy would, as previously described, be a series of cuttings, or small tunnels where necessity compelled such works through jutting ridges of hills, coming

down to the Cauly Nuddee from the higher mountains to the south, curving round the sides of these with a series of curved lines, bending often back from the river to avoid heavy works in embankments, or in masonry or iron pile viaducts.

The masonry works on this portion of the line would necessarily be the most important, not only in overcoming the deeply indented gorges in the side cuttings alongside the ridges, but in providing for the necessary waterway over the various streams that come from the southern range of mountains; these however are not very numerous, and though it is in this portion of the line of Railway that the maximum rain-fall is felt, the whole of the streams which I crossed or swam through during the height of the monsoon were all of a definite character, with well-defined banks, presenting no Engineering difficulties, whatever.

From Bolavy to Barbully the line would be direct, none of the spurs of the southern range of mountains coming down to the river, the line would require to be kept back from the river, and the necessary waterway provided over the different streams that flow into the Cauly Nuddee along this portion of the line. The average rain-fall of this portion of the Concan is about 120 inches, and as the labour required to execute the desired quantity of masonry, both for this portion and that required upon the ghauts up to the upper country

would have to be obtained from the Belgaum, Sattara, and Bombay Districts, and an advanced rate of wages given to induce the men to stay in the jungles for the greater part of the year, would necessarily make the masonry works the most expensive; and judging from the present difficulties of obtaining this kind of labour both for the works at Beikul and the Light-house on the Oyster Rocks, I should not consider that masonry works below and upon the ghauts could possibly be executed for a less sum than from 15 to 20 Rs. per cubic yard: this is certainly an excessive rate, but the difficulties attendant upon keeping men of a timid nature, and subject to the slightest alarm, in jungles away from their villages and people, liable to fever, and often experiencing difficulties in obtaining supplies of proper food, and being subject to the exactions of bazaar men and others, these, together with the constant combinations amongst the men themselves to raise the rate of wages, will, I much fear, cause what masonry works would be required, to be more than usually costly.

Secondly, the ascent of the Ghauts from Barbully to Yellapoor.—This portion includes the whole ascent from the lower to the higher level, and subject to the same rain-fall as the lower Concan, but with increased velocity in its streams, but does not along the whole length of the proposed line of works, (say 15 miles), present any object or particular

difficulty that would demand a detailed description ; the long series of tunnels found to be so necessary on the Bhore Ghaut would not, I imagine, have a single representative on this ascent. The course proposed to be followed has been pencilled by nature, and in following this small tributary of the Cauly Nuddee from Barbully up to its source near Yellapoor, the ascent is accomplished with but few difficulties. This portion of the line, like the river, would be a series of curves round the extremities of the ridges and spurs that come down to the valley, then bending back or proceeding across (when favourable) the different small vallons crossing the smaller tributaries, from the gorges and the upper levels of the hills coming down to them ; and it would be across these small streams that the masonry works of the ghauts would be required, together with such retaining and other walls that might be found necessary in proceeding alongside the hills in side cuttings, and which can only be accurately determined, after the surveys and sections have been completed.

For some portion of the distance up the ghaut the jungle is open, while in others it is dense and full of impenetrable bamboo, there are also some fine timber trees.

Thirdly, from Yellapoor to Hooblee.—This portion of the line is a stiff, undulating, wild-looking country, the Railway would therefore be a series of

cuttings and embankments with masonry works in the latter, the gradients would all be good, and descending with the traffic to the port. Yellapoor is about 240 feet below Hooblee, in a distance of 40 miles or 1 in 880; the average depth of cutting should not, I imagine, be over 9 or 10 feet, while the average of embankment along this length might probably be 10 to 12 feet.

The masonry works would not be extensive, there being only a few unimportant nullahs to be crossed; the Birtie Nulla between Kulghutgee and Hooblee being the largest and most formidable. The Public Works Department are now crossing this stream with a three-arched bridge, being a fifty-feet archway in the centre with one thirty-feet arch on each side.

Fourthly, from Hooblee to Bellary.—Having reached the black alluvial cotton plains of Dharwar, the chief characteristic of the proposed Railway along this portion would be a continuous low embankment over the country, keeping the formation level just above the water level of the rain fall, where the yearly average does not reach 75 inches. The earthworks from side ditches for the formation of embankments would therefore be very light, not averaging more than 4 feet in height. And as compensating for the very heavy masonry works on the ghauts and through the Concan, the masonry on this portion would be reduced to a minimum, owing to

the absence of large rivers or nullahs, there not being a single work of any importance between Hooblee and the Tungabudra river. At Koodatunny, 12 miles west of Bellary, a cutting through a small ridge would require to be executed, that divides the plains of Bellary from the Gadejanoor valley, this would not average more than 12 or 14 feet in depth, and is unimportant.

The Tungabudra river is the only work of importance on this length of line; this, I propose, should have masonry piers, as good foundations can be obtained on the rocky bed across both branches of this river with lattice girders from 80 to 120 feet span; the advantages of lattice girders being, that they can be shipped from England in small parts, and do not present much difficulty in getting the required carriage to convey them through the country.

The Permanent Way.—The permanent way proposed to be used in the present project, would be of two kinds, a heavy rail of 80 lbs. to the yard from the Port of Beikul up the Ghauts *vid* Yellapoor as far as the town of Hooblee, with fish joints, and supporting blocks up the ghauts, cast-iron chairs, and timber sleepers. The whole of the trenailing of the chairs inside the rails down the ghauts should have wrought-iron spikes. The permanent way from Hooblee across the cotton plains through to Bellary should not have a heavier rail than 50 lbs. to

the yard, using Graves' patent cast-iron sleeper, commonly called the "pot sleeper." The adoption of cast-iron sleepers across the plains is to avoid the heavy carriage of timber sleepers and the heavy cost of maintenance and renewals, besides the saving of a considerable period of time in construction, and limiting considerably the forest operations that would be required to supply the whole, for the 214 miles. By adopting such a classification of permanent way, and having the locomotive shops at Hooblee, the heavier class engines could work the traffic through the Concan up the ghauts, and through from Yellapoor to Hooblee, where the steepest gradients would have to be incurred, while a lighter class of engines could work the same trains on the easiest gradients of the line, over the cotton plains to Bellary.

With reference to timber sleepers, I have been informed by the Assistant Conservator in charge of the North Canara forests, that those forests could easily produce about 4 lacs of sleepers of the first class without deteriorating them to any material extent, besides giving a supply of timber of various kinds for the general purposes of Railway construction; but as wood cutters are very scarce and difficult to obtain, and carriage more so, it would become impossible to make any estimate as to the probable time that would be required to produce and deliver such a large quantity as 4 lacs

of sleepers along the intended Railway ; but as I have proposed that the timber sleeper road should only be laid as far as Hooblee to save time and expense, I think that the quantity required for this length, say 2 lacs to meet every contingency and for temporary sidings, &c. during the period of construction, might be cut and distributed along the proposed line in less than two years after the commencement of operations.

The average price of timber at the Government sales is about 8 annas per cubic foot for all kinds of jungle wood, except Teak and Blackwood (Beetie), which realizes from 1 to 2 Rupees per cubic foot. These rates are exceedingly high, in consequence of the difficulties attending the obtaining both woodcutters and carriage, together with the absence of proper management in the selection and depositing of the timber, and the great want of a conservancy system, similar to that instituted, and so successfully carried out, by Dr. Cleghorn with the Madras Forests.

In the timber operations of which I have had charge in Nuggur, Mysore, and with a seiniorage of 2 Rupees per tree, timber of all kinds, excepting Teak and Blackwood, could be cut and delivered on the banks of the Tunga and Budra rivers, then floated for several hundreds of miles down the Tunga-budra river, and finally carted for 36 miles into Bellary for a prime cost of 4 annas per cubic foot, with 7 annas 6 pies for hauling and floating,

making it only 11 annas 6 pics delivered in Bellary. Teak and Blackwood can also be delivered in Bellary inclusive of floating and hauling charges at Rs. 1-8-0 per cubic foot.

The following are six of the most approved kinds of wood for Railway sleepers, and which are plentiful along the proposed line of Railway ; they are—

Teak.	Jambay.	Honal.
Muttee.	Agam.	Nendy.

Upon the question of the cost of such a Railway, as giving an idea of the amount of capital that would require to be raised, is of course a most difficult and uncertain task ; to give any minute or detailed estimates without the necessary surveys and sections, or to illustrate what works would actually be required. But from long experience of such works, and a close examination of the country to be passed through, I shall, I think, be able to give such an estimate of the probable cost, that can only be found to be incorrect by the detailed estimates, or the actual cost of the line after construction, or other unforeseen contingencies, seriously affecting the operations of the Company.

In proposing the 80 lb. and 50 lb. rails, I have not considered it necessary to enter into the question of constructing a “ tramway capable of being worked by locomotives.”* Such a road to be

* See Notification in *Government Gazette*, upon the Sedashegur Railway of the 10th July.

capable of being worked by locomotives, implies strongly that it would eventually be worked by them, it then being no longer a tramway; and to be capable of being worked by locomotives, the substructure, permanent way, crossings, gradients, and all other appliances of such a road, must be of such a substantial character as to make it in fact a Rail-✓way. Besides this, a tramway in a proper sense of the term could not, excepting under great risk to public safety and delay, be worked down or up the ghauts, except by having numerous reversing stations, stationary engines, endless chains, and other appliances, sometimes adopted on the old tramroad system in the north of England, but now nearly altogether abandoned. Nor on the other hand, can any credit be obtained, by constructing what are in fact cheap railways, but called by another name, as *tramways*, to be afterwards found, upon the commencement of the working of the line for traffic, that bridges and culverts proved unsound, foundations giving way, wing walls altering their perpendicular, and requiring the line to be turned over temporary bridges and the works rebuilt; the line requiring to be constantly opened and lifted, cheap and rotten sleepers to be taken out and renewed, platforms lengthened, goods accommodation increased, and new sidings laid down, &c. Such are some of the material additions that often require to be done upon a cheap line after it is opened for public traffic, and are in no way to be con-

sidered as part of the cost of the original line. Such a line of Railway may be constructed, and has no doubt been constructed, for from 4 to. £6,000 per mile in India, with lines well laid, ballast clean and full, slopes trimmed and turfed, fencing and crossings all complete, station houses and goods shed, &c. making it appear a model railway and cheap for the money expended, called generally a 4 or £6,000 permile railway ; but when opened for traffic, and with all its wants supplied, the effects upon the roadway, bridges, &c. reinstated, and further accommodation provided, it has, I believe, generally been found that such a line has become in fact, though not called so, a Railway, costing from 10 or £12,000 and more.

In making any estimates for proposed works in India at the present time, it must be remembered that common labour has, within the last six or seven years, risen more than 50 per cent., while skilled labour of all kinds, including brickmakers, bricklayers, stone-cutters, masons, smiths, fitters, and carpenters has risen nearly 100 per cent., and this with but little increased skill in the craftsman, often less, owing to the increased demand having brought an inferior class to practise trades, on account of the high rates of wages they obtain.

The following statement of the probable cost would, I consider, be sufficient in amount, (if the Railway as proposed was economically and rapidly executed without a guarantee,) for the different

lengths of the Railway according to the nature of the country passed through:—

Statement of the probable Cost of the different Sections of the Proposed Line.

Section.	Weight of Rails per Lin. Yard.	DISTRICTS.	Length.	Cost per Mile.	Total Cost.
	lbs.		Miles.	Rs.	Rs.
1	80	From Beitkul Terminus to Mallapoor, one-half the distance through jungle (water carriage the whole distance)	20	1,00,000	20,00,000
2	80	From Mallapoor to Barbully foot of ghauts, through jungle and rough country	18	80,000	14,40,000
3	80	From Barbully to Yellapoor, being the ascent of the ghauts	15	1,20,000	18,00,000
4	80	From Yellapoor to Hooblee (20 miles being through heavy jungle)	40	70,000	28,00,000
5	50	From Hooblee across the cotton plains to Bellary, light rails and cast sleepers	121	60,000	72,60,000
		Total Miles.	214	Total Rs.	1,53,00,000
		Average cost per mile.			71,495

To provide an interest of 5 per cent. on the capital expended, and equivalent to the amount of the guarantee in other Indian lines, would be (annas and pies being omitted) per mile Rs. 3,574

To working expenses and maintenance of way per mile, at about the average of the present work expenses of Indian Railways open for traffic „ 3,500

Rs. 7,074

This amount of Rs. 7,074 would only be required to pay the working expenses and provide an interest of 5 per cent. to the shareholders, being equivalent to 9·89 per cent. of earnings; but taking even the present trade from Koompta, which will of course be diverted to the Railway and to the Port of Beitkul, which amounted to 50,000 tons of cotton export during last year, without considering either import or back traffic, and taking this traffic of one way only at the low rate of 2*d.* or 1½ annas per ton per mile would give—

50,000 tons of Goods at 2*d.* per ton per mile Rs. 4,166

139,584 Passengers at an average rate of 4 pie per passenger per mile „ 2,908

Equal Rupees required. 7,074

It is at all times most difficult to obtain any correct calculations as to the passenger traffic in such a country as India ; and no returns, however correctly compiled, of foot or carriage passengers along the public roads, can furnish any data of what proportion of these would be Railway travellers. But though a passenger traffic equal in money earnings to half the amount of the goods traffic may reasonably be expected, the line as proposed will be essentially a goods traffic line, as being most important to the country through which it passes ; it will therefore be necessary that the most ample goods accommodation be provided.

There cannot be any doubt, but when the Railway is open to the Port of Beikul so as to admit the cotton, that the whole trade of Koompta, Honore, Tuddry, Gungavally, Unkola, Vingorla, and Cundapoor, will be diverted to it, and which would give an up-traffic to the outport of certainly not less than 100,000 tons ; and there also cannot be any doubt but that the Railway would, when opened for traffic, in an incredibly short time, work the whole of the bandy traffic from the ghaut roads, where, at all seasons of the year that they are passable, forage and water are difficult to obtain.*

The import of cotton to the Port of Bombay

* The carts employed upon the through journeys from the interior to the port would afterwards be profitably employed

produced along the proposed line of Railway and at the back of the Port of Beikul in 1862 was 45,794,420 lbs., this being independent of shipments made direct to England and other ports from the minor ports on the Malabar coast.

In this trade of cotton alone the district of Dharwar, which is pierced by the proposed Railway, had in 1862, 378,416 acres under cultivation, producing 80,184,284 lbs. of uncleaned cotton, and 22,688,640 lbs. of cleaned exportable cotton. But besides the staple trade of this portion of the country, there would necessarily be a large trade both local and to the port of the different cereals, &c. including rice, cholum, raggi, sugar, oil, seeds, nuts, metals, and other bazaar commodities.

It is, I believe, a fact, that the ryots have, during the present sowing and ploughing season, ploughed out cereals from their lands and have planted cotton, in consequence of the English markets being firm, and the increased price in the value of the commodity being maintained. The fact therefore of the ryot growing a commodity which he must send away and sell, must necessarily give a great impetus to a cereal back traffic on the Railway, to supply food

upon supplying the Railway with traffic along the feeding roads on each side of it.

This absorption of the trade of the minor and inferior ports of the coast can only be effected upon the works of Beikul (giving wharfage and harbour accommodation) being speedily and satisfactorily carried out, according to the proposed plan of these works, described in connection with this paper.

to those districts who have partially given up growing cereals to grow the more valuable article of cotton.

But while the up-traffic from the interior to the port presents so favourable an aspect as an investment for English capital without a guarantee, the return traffic from the coast and along the line will be equally as good, being less bulky and more convenient to work. Of this, salt will be the most important. This Railway would have to supply North Canara, and the whole of Dharwar, Raichore, and the Bellary Districts, and also some part of Mysore to the south-east, and from these places it is impossible to imagine the distance such a valuable commodity to the people would be carried, the increase in the consumption, or the probable tonnage that would be required to supply the demand.

At present the merchants of Bellary nearly altogether deal with Bombay through the port of Koompta, obtaining their goods by the return bandies that convey cotton to that port. With the soucars and Banias, it is nearly impossible to obtain hoondies upon Madras, while these kind of bills, to any amount, can always be readily obtained upon Bombay houses; while in the event of any demand of goods that may be required, and not procurable in the market at Bellary, can by the merchant at that place be obtained from Bombay in 20 to 25 days during the season. With the Rail-

way opened to Bellary, the whole of the trade of that place would be diverted to Bombay.

The inland trade or back traffic on the proposed line would consist of salt, piece goods, rice, cocoanuts, sugar, oil, sopari nuts, metals, dye-woods, drugs, timber, bamboos, firewood, manufactures, metals, coffee, books, &c. The firewood traffic would be of such importance as to require independent trains, and this trade would expand itself from the western jungles to Bellary. At present a bandy load of firewood costs in Dharwar, for 300 to 400 lbs. in weight, Rs. 3-8-0 to Rs. 4, while it is about the same price or a little more, in Bellary.

As giving some idea of the road traffic at the eastern end of the proposed line of Railway at Bellary, I append a statement of the traffic on the public road leading westward towards the Dharwar District, taken by the Public Works Department during the years of 1858, 1860, and 1861, and though not pretending to be correct, will, of course, by the negligence of those employed, be under the actual number of either passengers, cattle, or carts proceeding along this road. Much of this will also be local traffic between the large and important towns of Bellary, Hospett, Cowaroor, Copul, Gudduck, Anigerree, and Dharwar.

Abstract of Traffic taken at Bellary on the road leading to Dharwar westward. List.

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Months.	No. of Days.	Carts.		Horses.		Asses.		Bullocks.		Native Men.		Native Women.		Euro- peans.		Camels.	
		Loaded.	Un- loaded.	Loaded.	Un- loaded.	Loaded.	Un- loaded.	Loaded.	Un- loaded.	Loaded.	Un- loaded.	Loaded.	Un- loaded.	Loaded.	Un- loaded.	Loaded.	Un- loaded.
1858.																	
June	30	1,049	10	250	8	1		462	49	329	2,070	879	1,646	2	2	..	..
July	31	1,008	7	159	8			345	38	194	2,015	111	409	..	..	..	..
August	31	4,580	220	2,190	308	702	272	3,860	536	586	7,408	470	3,140	..	..	..	..
September	30	4,116	326	1,748	240	340	144	4,278	376	744	6,744	478	2,822	..	..	..	..
October	31	8,350	8,752	4,348	185	3,337	2,513	11,020	3,503	982	16,223	699	8,311	..	..	..	..
November	30	10,595	4,751	12,371	3,142	4,737	4,259	20,717	5,262	2,163	24,263	4,375	14,656	5	14	..	..
December	31	16,381	9,473	19,150	3,196	15,020	5,909	27,743	9,407	5,348	29,289	4,996	18,434	..	..	..	..
1860.																	
September	30	5,234	489	1,832	498	460	201	6,378	789	914	10,000	595	3,238	..	..	..	..
October	31	9,450	9,232	6,448	385	4,478	3,623	12,960	4,830	829	15,633	793	10,410	..	..	..	..
November	30	3,008	44	468	500	1,552	25	976	2,208	1,340	6,320	774	1,408	..	..	..	..
December	9	6,816	592	17,740	300	5,340	476	2,328	1,432	5,820	6,868	892	1,264	..	..	..	..
1861.																	
February	28	3,740	6,486	4,346	449	1,614	4,307	2,698	4,365	2,756	2,922	1,002	984	..	..	..	..
	342	74,327	40,682	71,050	9,216	37,581	21,729	94,465	32,795	22,005	129,755	16,064	66,711	7	16	..	..

As the export of one commodity alone (cotton) from the Port of Koompta last year was 50,000 tons, this, with the trade of the minor ports, and calculating upon a reasonable increase when the port of Beikul is opened, together with the export of other articles, and with a back trade as important as that to the coast, it will not be unreasonable to calculate upon 150,000 tons per annum being drawn to and from the Port; and calculating that the passenger traffic will at all times be equal to half the earnings of the goods traffic, the statement would stand as follows, giving a nett profit of 14.70 per cent. upon the cost of the Railway, after paying working expenses, and with reduced rates in the carriage of goods from 1 anna 6 pie to 1 anna per ton per mile:—

To 150,000 tons of goods at 1 anna per ton per mile	Rs. 9,375
222,576 passengers at 4 pies per passenger per mile	„ 4,637
	Rs. 14,012
Deduct for working expenses, maintenance of way, &c. at per mile	Rs. 3,500
Nett profit per mile..	<u>Rs. 10,512</u>

Such a result as this cannot be considered as imaginary, if the line is constructed without a guarantee, so as to enable any company undertaking

it to be altogether unfettered and free from the complications and annoyances that have, in the case of nearly the whole of the Indian Railways, surrounded them, which have been like a millstone round their necks in preventing progress ; and all I apprehend that will be required, will be the approval by the Government of the general direction of the proposed Railway from the Port at Beitkul, *via* Yellapoor, Kirwutty, Kulghutgee, Hooblee, Anigerree, Gudduck, Dumbul, Coworoor, Copul, Hospett, Tornegul, and Bellary, and that quarterly or half-yearly Reports of the progress of the works should be made by the Consulting or Deputy Consulting Engineer of Railways to the Government, so as to keep the Government fully informed as to the Railway Company's operations. Also, that the Consulting or Deputy Consulting Engineer should, upon the completion of any portion of the line, go over and examine the same prior to its being opened for public traffic, to ascertain that the works have been well and substantially executed, and that it can be worked with perfect safety to the public.

The present proposal, though considered as one project in the foregoing description, should be divided into two operations ; that capital should be provided in the first instance, and the whole of the energies of the engineering staff devoted to the construction of that portion of the line between

the Port of Beitkul and the town of Hooblee, and opening the portion from Hooblee to Mallapoor on the river as early as possible ; this would at once tap the District of Dharwar, and the extension of the works forward could then be proceeded with. This length would be 93 miles, and would include the whole of the heaviest works between Hooblee and the top of the ghauts, and the line from Barbully at the foot to the outport.

In constructing the present proposal without the guarantee of 5 per cent. from the Government, the Railway Company will be enabled to give their best considerations to the economical construction of the works and the working of their staff, being independent of forms of accounts, running through the whole alphabetical list, and now considered necessary to give employment to the immense office establishments that grow up in the different departments under a guarantee. Had this power of economy been fully exercised by some of the Railway Companies in India, no difficulties or inconveniences would have ever been felt, with reference to funds, as capital would have been in hand to have tided over any financial crisis such as that which they felt and suffered from in 1861-62. While upon the Railways to which I refer, and where a laxity of system prevailed, the surveys alone for a great portion of the line of works cost upwards of Rs. 1,120 per mile, or Rs. 22,400 for a district of 20

miles, between the time the surveys were commenced (with a costly Engineer and his staff located in each district) and the transfer of the land for the actual commencement of the works of the Railway ; thus for a hundred miles of Railway Rs. 1,12,000 would be sacrificed to a system, which, if it had been free, would probably not have cost more than one-quarter this sum.

It will therefore be (in the present proposal) the keeping every man fully employed, with limited establishments, that will be the first item of economising.

Upon the North-western line of the—— Railway, more than £50,000 has been sacrificed to this want of a properly organized system of full occupation for the staff. A line was staked out, and everything ready for the commencement of about 160 miles of Railway, when the difficulties of finance surrounded that part of the project, and the country and everything that had been done nearly altogether abandoned. It would be difficult to imagine how thirteen Engineers and their establishments could be kept 3 years upon their several districts and not one mile of Railway executed.

In constructing masonry works, there cannot be any possible necessity for constructing the whole of these works along the whole length of the Railway as for a double line of rails (as has been done upon the Railways in India up to the present time) ; it is drowning capital, and sinking just one-half the cost of all masonry works that cannot possibly be requir-

ed for at least a century to come, if ever, and from which expenditure of capital no interest accrues. It would be nearly as wise to construct double embankments, and lay down a double rail, with a determination not to run trains upon it, or make use of such expended capital, until the single line was over-crowded with work ; it will therefore be upon the works in masonry that the second point of economy will be exercised in the present proposal.

The permanent way, and the proposed adoption of the timber sleeper road as far as Hooblee, is with a view to economizing capital, to save endless delay and trouble, and to curtail heavy and expensive forest operations. The light rail proposed from Hooblee across the plains of Dharwar, in connection with the heavier rail from Hooblee to the port of Beikul, is the third point of economy in the present project. With reference to the amount of work, even lighter rails (than those I have suggested to be used over the plains) can perform, it has been previously ascertained with great accuracy on the Belgian Railways, where experiments of this kind have been more fully inquired into than upon any of the English lines, that taking into account every circumstance of position in which the rails were laid, that a railway composed of rails weighing $48\frac{1}{2}$ lbs. to the lineal yard, would give passage annually to 3,000 trains of 14 waggons per train, and would last 120 years, giving a total amount of work of

360,000 trains before it would require to be altogether relaid.

In adopting and laying down a light rail of 50 lbs. to the lineal yard across the plains of Dharwar and through to Bellary, it at once establishes a permanent and settled question with reference to the rolling stock, that with a light rail, the rolling stock cannot be increased in weight beyond a certain point consistent with safety to the working of the trains at reasonable speeds. As has been done upon other Indian lines, simply because they had a costly, and I may say an extravagantly weighty rail of 84 lbs. to the lineal yard, altering and adopting this, from a substantial and proper rail of 65 lbs. to the lineal yard. Upon all ghaut works, such as the Bhore, Thull, and Barbully ghauts, a heavy rail is of course necessary, and is practical economy.

In advocating a 50 lb. rail, I am not doing so as incompatible to meet the demand of work that might be put upon it, or not consistent with perfect safety to goods and passengers; but I am convinced that 1st class passengers need not weigh 6 and 7 tons, 2nd class the same, and 3rd class between 6 and 7 tons, open goods waggons between 4 and 5 tons; these being loaded only to 6 tons, while the passenger carriages do not on the average carry more than 20 persons each, or about 2,520 lbs., being a little in excess of 1 ton.* Such

* Weight of the rolling stock on the Madras Railway.

are a few of the errors that have effected some of the Railways in India, and the result is, that where the positive dead weight to be hauled by each engine, so nearly assimilates to the load carried in goods trains, and in the passenger trains is so much exceeded, that the economy of tare in rolling stock has hardly received that careful consideration it so fully demanded to approach a maximum.

To construct such Railways as these, and under such circumstances, is to sink wilfully the capital of the shareholders in heavy permanent way and rolling stock, that no amount of traffic that can in the present state of India be obtained, will give them their full and proper work or be remunerative. Such a road may in time be exhausted or worn away by hauling the tare dead weight of rolling stock ; but such a mode of constructing Railways for India is altogether besides perfection, either in construction or working, or what is required in the present state of the country and its people ; and I imagine, that it has been these latent evils, that though not seen in minute detail by either English capitalists interested in India, or the shareholders who have invested their money, yet have perceived the broad error that such a heavy class of works were altogether unfitted, and the desire became greater to give this country a more economical kind of communication, in the Tramroad Company under Sir Macdonald Stephenson, whose name will be deservedly and lastingly connected

with the Railway system in India, the tramroads were intended, and as they were originally worked in England for cattle, but more mature consideration made them into tramroad or cattle railways, capable of being worked by locomotive power, which was in fact an institution of a cheaper and more suitable railway, adapted more to the present and future wants of the country. And such is the intention of the present projector, though not using cattle, but economising steam power and still doing the trade of the country. And by the judicious adoption of such a system, it is hoped also to secure a fair and profitable return on the capital expended.

That with the exception of the termini at Beitkul and Bellary, no first class stations should be erected, and these should be simple plain structures, with the maximum usefulness obtained at the minimum cost. All the other stations should be of the simplest kinds, one booking office and store-room, with plain walls of stone or burned bricks, and covered with tiles or terraced; no verandahs, but with ample platforms partially covered. I would intend such structures as these for all intermediate places between the termini, where exists native traffic only, and where native station masters are generally employed.

Wherever the goods traffic is the maximum trade of the place, the goods sheds and their appliances should be the most important works, the buildings

roomy, commodious, and dry ; and this necessity cannot be too strongly urged, that to obtain the whole of the goods traffic from the natives in the interior, that in all cases their property should be treated with care and consideration, in good and substantial sheds, and watched over and cared for by honest and trustworthy servants.

The native, either as a consignor of goods or as a passenger by the trains, does not, as a general rule, care much for personal comforts, he cannot appreciate, nor does he require handsome, extensive, or ornamental booking offices or waiting rooms, while his cotton bales, Indigo chests, dubbers, or seed bags are thrown about and carelessly neglected. Secure these from damage, and keep him free from exactions and black mail upon his goods or commodities, give him a pial upon which he can seat himself and contemplate the rapid returns that will accrue to him by the speedy and careful transport of his goods, and you get as far as it is possible into his confidence and make him contented. To arrive at such results as these, by considerations such as I have attempted to describe, will be another of the points of economy that will, it is hoped, be exercised in carrying out this project.

I have, however, seen goods on an Indian Railway lying outside saturated with rain for days together, with the owners in an attitude of supplication to be permitted to carry them away, and send them accord-

ing to their *mamool* by native carts. I have known cotton trains to be fired during transit, and all compensation refused to the owners. Such information flashing to every quarter of the country amongst the native cotton growers with the rapidity of electricity, to hundreds of miles on each side of it, it is not surprising to find, that when the property of the native merchant is treated in such a manner, that that Railway is not paying much more than its working expenses, and that it has not succeeded, by such a mode of traffic management, in drawing the traffic from the road to the Railway. These are things that it is hoped however will be altogether avoided in the present work. The line will go through and amongst the most advanced and best informed native population in India, and it will, I trust, be the ruling endeavour of the Company who undertake this work, as it is of the projector, to obtain their confidences, and with it their goods, commodities, and persons as travellers.

Having completed these remarks upon the proposed Railway, it only remains for me to suggest those conditions which I should presume should form the basis of negociation between the Government and the Railway Company to carry out the project to its entirety, under a system by which the necessity for any guarantee is avoided, and to show how far the Government can, by its encouragement and liberality, encourage English capitalists

to undertake works of such a profitable and reproductive character in this country, without the entrammelling and imaginary security given to such investments by a guarantee upon the capital raised, forcing shoreholders into an chimerical security and confidence, and rendering even Boards of Directors insensible to a proper sense of their duties, as gaurdians of the capital sums received and expended. Under a gaurantee time is of no object, energies that in this country and with such works should vibrate to their utmost strain to get them completed, become deadened, and insensibly glide down into the official groove of letter writing, checking accounts, and official correspondence in its gravest forms of width, length, and margins.

In the present project there is much to do, and the object will be to do it both speedily and well; undertaking the traffic of the district of Dharwar at once, by improved carts and transit bullocks, and engaging to cart the whole of the trade, or as much of it that can be obtained from the interior, to Mallapoor, along the new proposed road and from thence in barges or lighters down the river to the outport. And there is no reason why, if sufficient energy is excited to commence the work in an earnest spirit, that this operation should not be satisfactorily established and in working order in less than a year; and it would be eventually found that, by commencing with such an establishment in connexion

with the actual construction of the line of Railway, it would at once possess advantages within itself that would place it altogether above, and out of comparison with any other Indian Railway, either in the Bengal, Bombay, or Madras Presidencies.*

The following are the conditions which should form the basis of negotiation between the Government and the Railway Company:—

1st.—That the Government should grant to the Company, free of all charge, within twelve months from the date of concession, the whole of the land necessary for the construction and efficient working of the said Railway, its stations, sidings, and stopping places.

That the surveys and sections of the different portions of the said Railway be forwarded to the Government, showing the land required for the construction of the works of the Railway, to be handed over within one month of the receipt of the said surveys and sections by the Government.

* As showing the value attached to the Bellary district for the supply of cotton, the Earl of Shaftesbury presented a petition to the House of Lords, and Mr. Bazley to the House of Commons, in August last, from the Cotton Supply Association, stating that the Madras Irrigation Company had expressed their desire to make a canal from the Bellary district to Madras on the eastern coast without any guarantee from the Government. How much more desirable is the construction of a Railway into that district, and connecting at once with one of the best ports in India on the western side of the Peninsula. The distance by a canal to the east coast would be over 300 miles, while to reach Beikul the distance is 214 miles.

2nd.—That the Government should also grant all lands required for permanent or temporary purposes, free of all charge, either for engineers' or inspectors' bungalows, workshops, brickfields, stone quarries, lime and ballast pits, within two hundred yards on each side of the centre line of Railway.

3rd.—That the management of the construction and working the Railway should be left entirely in the hands of the Railway Company; and that the Company shall bind themselves not to charge a higher rate per mile, either for passengers or goods, than the maximum rate of charge on any of the Indian Railways now in work.

4th.—That the Railway should undertake to carry all troops, military stores, baggage, &c. at the same rates as on other Indian Railways, and that a Mail carrying contract be made between the Government and the Company.

5th.—That the Government admit all materials, raw and manufactured, necessary for the construction of the Railway free from customs' duties.

6th.—That the Railway Company undertake to clear the whole of the jungle to 100 yards on each side of the centre line of Railway from Beikul to Davykop, and that the Railway Company shall have full right to take possession of all such timber so cut and within such limits free of all charge.

7th.—That the Railway Company shall be permitted to cut the following, and such other kinds of

timber that may be found and approved for Railway construction, either for sleepers or other and general purposes;* that such timber trees to be selected with a conservancy officer of the Government and marked, and a seigniorage of one Rupee per¹ tree to be paid by the Railway Company to the Government :—

Teak.	Agaum.	Nendy.
Muttee.	Beetie.	Jambay.
Honal.		

8th.—That the Government should abandon the Kygah ghaut road, and that the Railway Company be permitted, under the sanction of the Government, to construct a 20-foot road from Mallapoor, on the river Cauly Nuddee, alongside the intended line of Railway, and to join the new road at Yellapoor.

Such road to be for the public use and benefit.

The cost of such road to be repaid by monthly advances to the Railway Company by the Government.

9th.—That, after the construction of such road, the Railway Company shall, at the Government expense, keep the said road in thorough and efficient repair, until the opening of the Railway for public traffic up to Yellapoor, when it should then be handed over to the Government.

10th.—That the Railway shall, upon the completion of the said road, and in connection with their traffic department, undertake to open up the Traffic

* In the jungles of North Canara, and adjacent to the Railway.

of the Dharwar district to Mallapoor by improved carts with relays of bullocks at an average of 5 miles on the transit system; this mode of carriage to be continued till such time as the Railway is completed and opened for public use as far as Hooblee from the outport at Beitkul or Mallapoor.

11*th*.—That the Railway Company undertake to construct a single line of railway, with such siding accommodation, and stopping places that may be required.

12*th*.—That the general direction of the line of Railway be laid out to the satisfaction of the Government, and that the following route be approved from the Port of Beitkul, *vid* Yellapoor, Hooblee, Anigerree, Gudduck, Dumbul, Copul, Hospett, Tornagul, to Bellary.

13*th*.—That the gradients permitted to be adopted by the Railway Company on the Ghauts between Barbully and Yellapoor to be not less than 1 in 30, with curves of not less than 5 chains radius; that from the Port of Beitkul to Barbully in the Concan, and from Yellapoor to Hooblee, the gradients to be not less than 1 in 75; and from Hooblee across the plains of Dharwar and on to Bellary no gradients to be less than 1 in 100.

14*th*.—That the permanent way from the Port of Beitkul to the town of Hooblee be a double-headed rail of 80 lbs. to the lineal yard, laid in cast-iron chairs, with wooden sleepers laid transversely. The

inside of the line of rails on the ghaut between Barbully and Yellapoor to be iron-spiked. That the rails from Hooblee across the plains of Dharwar and through the Bellary district to the town of Bellary to be 50 lbs. to the lineal yard, laid in Greaves' patent cast-iron sleeper and chair. The gauge of the proposed Railway to be the Indian gauge of 5 feet 6 inches.

15th.—That the masonry works of the Railway in viaducts, bridges, culverts, retaining walls, &c..shall be constructed as for a single line of Railway.

16th.—That the Government undertake, (within two years of the completion of and opening for traffic any portion of the intended Railway to any important or second class station,) to execute and complete feeding roads from the line of Railway on each side of it into the several districts beyond, connecting such roads, where possible, with the leading and main roads of the districts from one zillah to another.

17th.—That the Consulting or Deputy Consulting Engineer to the Government be permitted to go over and examine the works, either quarterly or half-yearly, to report the progress of the Company's operations for the satisfaction of the Government.

18th.—That the Consulting Engineer to the Government and the Chief Engineer of the Railway Company, go over and examine together the proposed works when completed, and prior to their being opened for public traffic. Upon the Government

being satisfied that the proposed Railway has been constructed in a substantial and workmanlike manner, consistent to the safety of the public, the said Railway shall then be opened for public traffic.

19th.—That the Government shall credit the Railway Company with 5 per cent. interest upon all capital paid into their Treasuries, either in England or India, and credit the account of the Railway Company with the due and proper amount of exchange, in transferring such capital for expenditure in India, the same as with other Indian Railways.

20th.—That the Railway Company shall at all times be permitted to draw monies from the Local Treasuries in the district upon General Treasury Bills, and that such Treasuries shall at all times be provided with sufficient funds for the construction of the line of works adjacent to them.

21st.—That in the event of unforeseen circumstances preventing the raising of capital for the due and proper completion of the line of Railway, the Railway Company shall be empowered to issue debenture shares upon the said Railway and its works; such shares to be altogether taken up by Government, and monies advanced to the said Railway for the due and proper completion of their undertaking. Such debentures to bear a deferred interest of 5 per cent., payable after the shareholders have received 5 per cent. interest on the working of the said Railway.

*Tabulated Section of the proposed Railway,
shewing Mileage and Height above Sea Level.*

No.	Stations.	Distance in Miles from the Port,	Height above Sea Level in feet.	Differences.
1	Beitkul (Sedashegur) ..		Sea Level	
2	Mallapoor	20	90	+ 90
3	Barbully	38	150	+ 60
4	Yellapoor.....	53	1,725	+ 1,575
5	Kirwutty	65	1,680	— 45
6	Kulghutgee	77	1,750	+ 70
7 8	Hooblee	93	2,010	+ 260
9	Annigerree	113	2,025	+ 15
10	Gudduck.....	125	2,026	+ 1
11	Dumbul	137	2,005	— 21
12	Coworoor	148	1,705	— 300
13	Copul	162	1,800	+ 95
14	Hospett	178	1,505	— 295
15	Tornagul	198	1,603	+ 98
16	Bellary.....	214	1,600	— 3

BEITKUL HARBOUR.



OF the different classes of reproductive and remunerative works that present themselves in this country for the favourable consideration of a Government so fully alive to the best interests of its people, there cannot be any one of the class so important as the formation of an outport, and such an one as Beitkul, where a small and definite expenditure would produce such grand results, executed in connection with the proposed Railway, opening out the immense tracts of valuable country behind, giving a teeming and industrious population an outlet for their produce, and receiving for them everything that they require. And while up to the present period there may have been some desire to centralise the whole of the trade to the commercial capital of India, as Bombay really is, the time has now arrived when it becomes desirable that the more bulky business of commerce should be shipped from some other places than the limited accommodation Bombay affords; and while the head quarters of the commercial houses of Western India could be at Bombay, Beitkul could

readily be made its principal auxilliary port ; it being nearer to the cotton producing country of Dharwar, and as cotton presses are about being erected and a township formed, this commodity could be shipped direct to England and other places.

But Beitkul has been up to the present time unfortunate. Up to a very late period, and while it formed an appendage to the Madras Government, it was amongst the most inaccessible places in India ; and, like the insurmountable peaks of the Hymalayas, it was only known by name, and was probably much better known two centuries ago, when Cadavand had its English factory with pat-tamars and other craft sheltering themselves in this bay.

Of late years its existence has been slightly noticed ; Sir Arthur Cotton visited it and brought it within his great scheme for watering all the plains of India, by proposing a canal from the Cove up the ghauts, in his paper "Iron versus Water." Many others have made Beitkul a subject for proposals of different kinds, Officers of Engineers and other corps, the Civil Service, Commanders in the Naval Service, Merchants of Bombay, and Doctors of Medicine have all worked upon Beitkul, and busied themselves with the mysterious and craft of an Engineer, raising up obstacles to every proposition of an opposite nature to their own, and bringing up all the evils that are supposed to destroy such works. Opposing currents, siltings to

be formed, bars to bar all entrance into the harbour, and breakers to break up any works that might be proposed by any other person beside themselves. Upon one plan a pier is thrown out on one side of the bay ; in another, the pier, it is considered, should be on the other side of the Cove ; while before me is a plan showing a pier on each side, opposite to each other, their ends nearly touching, leaving a narrow entrance, similar to that formed by the Colossus of Rhodes.

It is true that there is a shore current, running southwards during certain seasons of the year past the mouth of the Cauly Nuddee, and bringing with it the floating matter brought down by the river such as dried timber, bamboos, and other refuse ; but it does not, except under special circumstances of extraordinary floods, bring any solid matter in suspension that would form what is generally called silting ; and in the present proposed plan, the object of having the eastern and western piers constructed of open piling, is to admit this current through them into the cove on one side to make its exit on the other. It is what may be called a surface current only, not forming a part of any of the main and periodical system of currents that prevail outside the bay of Sedashegur, and running north and south at different periods of the year past the western point of Carwar Head, and Loleim point to the north ; it is sluggish, not possessing a velocity of more than half a mile per hour, nor containing force sufficient to retain solid

matter in suspension ; while to prevent any alteration in the depth of water from causes that might be created by artificial works extending themselves into the bay or toward the entrance of Beitzkul Cove without entirely closing it by dock works, the present proposed wharves follow the natural conformation of the land, so as to prevent altogether the many phantom evils that have arisen before the eyes of previous unprofessional projectors.

The design has also been planned, with reference to the mode of construction, to provide at as early a period as possible the necessary amount of accommodation required at once at Beitzkul, and is, considered after long and mature consideration, sufficient to meet all the wants and requirements of trade for many years in the future, and arranged also so as not to interfere with any dock arrangements that might eventually be formed and carried out in connection with the present proposal.

The design consists of an outer ship harbour, enclosed by two open piers and slips, containing an area of 57 acres, with wharves open to the bay on the west side of 1,210 lineal feet, and on the east side from Koney bridge to the pier of 1,810 lineal feet ; while the inside wharves, on the west side, are 1,430 lineal feet, on the east 2,750 lineal feet, with a Customs wharf of 1,200 lineal feet. Besides this ample accommodation on the sea face, wide roads and convenient building sites would be recovered from the wharf walls to the

hills at the back. The inner portion of the Cove forms a suitable and convenient pattamar, boat, and lighter harbour, with an area of more than 40 acres, which could be cleared out by dredging, so that a mean depth of 4 feet of water could be maintained at low water throughout, being at all times of high water of sufficient depth to admit pattamars and country vessels. This boat harbour, if permitted to be constructed on the present plan, would possess broad and capacious wharves on each side of it, while to the south it is open to the village of Beikul, now a fishing village, consisting of a few miserable huts, which should at once be appropriated, the owners compensated, and the hovels cleared away for the formation of streets and building sites, to be planned in connection with the proposed town of Freretown described further on.

By adopting the pile construction as shown in the detail of the proposed wharf wall on the plan, early accommodation would be provided for the shipment of the whole of the cotton produced in Dharwar, Bellary, and the adjacent districts, as well as absorbing some of the trade of the minor and inconvenient ports along the coast, by using the timber in the forests at the back of Beikul.

The piles should be driven down to 12 or 14 feet in depth at every 3 feet, and sheeted up to the level of low-water mark both inside and out, and with a base of *père per du* rubble work, it should then be filled in with good concrete or beton, formed with

the material found in the vicinity, or with the Aden pumice, and upon this masonry walls backed with laterite to 6 feet above high-water level. The filling at the back, as well as the material required for the masonry walls, would be obtained within 300 feet of the work, so that, with proper supervision and workman-like economy, the works could not possibly be of an expensive character.

It has been a leading consideration in the present design to economise the material, so that all material that would require removal for providing the required accommodation on the land side, would be used for building the wharf walls and filling up to the required level at their back, so that, independent of the accommodation given to ships' boats and the trade generally, the value of the areas in recovered land for building sites would more than repay the whole cost of the works in four or five years after their completion; while, upon the completion of any of the wharves proposed, they would at once be profitably productive.

Commencing at a sufficiently low level to get over the stream by bridging the small stream south of the village of Koney, the piling should commence from the western abutment of this bridge, and continuing to rise to 6 feet above high-water level for a 1,000 feet, up to the open pile pier on the 1st section of the proposed work, the solid portion being 200 feet at the commencement of the open

pier, and turning southward, forming the eastward side of the ship harbour, up to the culverted stream that has its outlet into the proposed harbour, from the hills to the north of the Manchester Cotton Company's works at Alliguddy.*

The outer pile pier, proceeding NW. into the bay from the outer corner of this section, would be 200 feet broad at its commencement and 650 feet in length, the increased head at its termination being 150 feet square, with a landing slip on the inside to the harbour. This being the land side pier, should have a bude-light on its termination. To commence and complete this small portion of the proposal, being Section 1, would give at once to Beikul pier and wharf accommodation to the extent of 2,810 lineal feet, with a recovered area of land for buildings and roads of 45,872 square yards.

The chequered dark line on the plan round the outside of the wharves, shows the limit of recovered land from the hills to the rear, in obtaining material for filling the back of the wall and masonry.

The second section of the proposed design is the wharfage on the inside of the outer harbour, opposite to the Manchester Cotton Company's land, from the south wall of the culverted nullah, to the north of their site, to the east wall of the large open nullah running into the harbour from the south-west side of

* The two streams mentioned have clean rocky beds, and do not bring down silting deposits.

their allotment. The extent of wharf accommodation this section would give is small in comparison with the great area of land recovered for building purposes. The roadway should proceed along the front of the Manchester Cotton Company's land. The sea face of the wharf along this section would be 650 feet, while the area of recovered land for building plots and roads would be 51,273 square yards.

The 3rd section would be the most important, both with reference to the sea frontage to the ship harbour, as well as the recovery of a most valuable site of land, being intended in the proposed plan to be the Custom's wharves with sheds, and to have two landing slips to the outer harbour. For this department it is the most desirable site in the whole bay, as commanding the ship harbour and the bay outside, as well as having the boat and lighter harbour within the cove between the hills on the main land and the Hill of Carwar. Such a position would, with moderate supervision and a minimum establishment, thus prevent any traffic with boats, lighters, or pattamars entering or going out of either harbours without being noted by the Custom's or the Master Attendant's department.

This section would possess 1,200 feet of wharf wall to the outer ship harbour, with two landing ships, and 530 feet of sea face wharf to the inner boat harbour, with an area of recovered land of 55,866 square yards.

Following the wharfage round according to the accompanying plan from the stream near Koney, we

approach the 4th Section, being the wharfage to the sea and recovered land in the inner boat harbour, forming a straight length of wharf of 2,380 feet by 270 feet in width (part of this straight portion has been calculated as belonging to the Custom House Wharf). A considerable distance along this wharf from the south end of the cove could be piled and altogether built with masonry inside the sheeting during low water ; the sand to be afterwards removed and used as filling for the land at the back of the walls, and a depth of 4 feet of water obtained throughout the southern portion of the inner harbour. The outer harbour could be dredged and kept clean to 12 and 14 feet in depth at low water at all times, and this material taken by barges for backing up the wharves.

The wharf open to the sea of this 4th section would be 1,860 feet, while the area of land recovered at the limit taken by the black line would be 57,086 square yards, though some additional land could be obtained by building back into the indents in the sides of the hills.

At the southern portion of the inner harbour, the accommodation for roads and building sites could be extended over the site occupied by Beitkul and the cultivation belonging to it, across the isthmus as far as desirable, and on to the slopes of the hills on each side.

Section 5 is on the southern or three-sided portion of the inner boat harbour, opposite to the fishing village of Beitkul, this terminates what is called Beitkul Cove, in the narrow isthmus of sand that

connects Carwar Head with the main land, the distance from the south wharf wall of the boat harbour and the beach of the western coast being under 2,000 feet to its nearest point, and containing a little wet cultivation, cocoanut, and other trees ; this area, between the hills and the sea and Beitkul Cove, though believed by some to be suitable for the new town, is altogether out of the question ; and, though a few buildings of an official character, warehouses, &c. might be built here, with a few residences on the hills on each side, the area is altogether too limited, and too much exposed to the fierce assaults of the south-west monsoon rushing through this gullet with the force of a whirlwind : any buildings erected here, could only be as an adjunct or business places for the residents in the proposed new town proposed to be built on the site of Koney, which possesses every advantage, being protected from the south-west monsoon, having unlimited space both to the sea and inland, with the beautiful hill sides and undulating spurs for the dwelling houses of the residents of the Port ; while it would be convenient to the Railway, and to embarking upon, and landing from ships in the harbour. It also possesses a good level for securing proper drainage from the town.

As in the inner boat harbour there would be a constant traffic in loading and discharging goods coming and proceeding along the Hydragah ghat from the south *viâ* Unkolah, Beitkul would be the best suited

for the location of warehouses, stores, and the working population of the port. The wharfage to the sea of the southern portion forming the 5th Section, would be about 1,000 feet, while the wharfage land recovered and taken at 250 lineal feet in width, would amount to about 35,277 square yards.

The 6th Section of the proposed work is the wharfage and recovered land on the west side of the inner boat harbour, and the east end of Carwár Head to 250 lineal feet in width, the wharfage accommodation to the harbour being 1,490 feet in length, with a superficial area of 40,833 square yards available for roads and building land.

The 7th Section comprises that projecting portion of the wharf inwards on the west side, and forms the narrowing entrance into the inner harbour of 600 feet in width; it also inclines backward to the north and forms the west end of the outer ship harbour, and, turning round the base of the western pier, joins the projecting rock in the open bay of Sedashegur. This wharf is of varying widths, being to the inner boat harbour 300 lineal feet, to the ship harbour 200 feet, and to the open bay 340 feet in width. The lineal length of wharfage open to the sea is 2,080 feet, while the area of the land recovered and available for building and other purposes is 44·476 square yards.

The 8th and last Section comprises the western pile pier, forming one of the arms of the outer ship harbour, and is of the same construction as that pro-

posed for the eastern pier, constructed either of preserved timber, piling, or the screw or disc pile. This pier affords wharfage accommodation on both sides to the extent of 1,400 lineal feet near to the deep water of the bay, accommodating those ships that draw too much water to enter the outer ship harbour. The pier proposed has a square head of 150 feet square, with a landing slip inside. With such a pier as this, the steamers working down the coast to the minor ports could enter the bay of Sedashegur, and come alongside this pier either on the outside, the end, or the inside, as circumstances permitted, land her passengers and cargo, and proceed on her voyage; a convenience she would not possess at any other Indian Port, not even Bombay.

The wharfage and areas of the different sections of the proposed works I have described are as follows:—

Sections.	Lineal Length in feet of Wharfage.	Total area of Land in each Section. Sq. yards.
1	✓ 2,810	45,872 ✓
2	5 ✓ 620	51,273 ✓
3	✓ 1,730	55,866 ✓
4	✓ 1,860	57,086 ✓
5	✓ 1,000	35,277 ✓
6	✓ 1,480	40,833 ✓
7	✓ 2,080	44,476 ✓
8	✓ 1,400	9,500 ✓
Total..	12,980	3,40,133

70 acres

The areas in the above table are taken to a limited width only of 250 feet round the south end of Beitkul Cove, but the 20 plots of building land as shown on the plan amount independent of roads, to 262,533 square yards. This area, being only a limited part of the land about the village of Beitkul, would at a nominal rental of 4 annas per square yard per annum, yield a nett return of $6\frac{1}{2}$ per cent. upon the estimated sum of 10,03,632 Rupees, the cost of such an undertaking. This is supposed the land at Beitkul to be resumed under the Act for devoting it altogether to Government purposes; or supposing the land to be sold outright at a rate of 1 Rupee per square yard for the recovered as well as the lands adjacent to the wharves, would represent a money value of 2,62,533 Rupees. Such a work as this becomes, therefore, one of a most profitable and reproductive character to the Government, not only in giving a very large interest upon the capital expended, but in benefitting to a very considerable extent every source of trade that may have connexion with the port.

I have appended, in the absence of required detail and cross sections, an average estimate per lineal yard of wharf and pier, with concrete filling, rubble masonry, metalling, &c. and though not pretending to be absolutely correct, cannot be said to err on the side of being under-estimated, as taking the whole of the works together, I am sanguine that they could

be completed for a much less sum. And again, I have not considered the whole extent of available ground, but only that limited quantity in the plots shown on the plan, nor have I considered any Customs, wharf, harbour, or other dues, which may be left to provide the interest of the expenditure in constructing the Custom House and its sheds, &c.

Average Quantities and Cost of a Lineal Yard of Wharfing, Filling, Mettling, &c.

Quantity.	Per Cubic Foot and Yard.	DESCRIPTION.	Rate.	Total.
			Rs. a. p.	Rs. a. p.
60	Cub. ft.	Of Teak cutting, working, and carriage, at	1 0 0	60 0 0
32	lbs.	Of wrought iron, at	0 4 0	8 0 0
12	Cub. yds.	Concrete with rubble, at	1 0 0	12 0 0
5	"	Masonry, laterite, &c., at	12 0 0	60 0 0
120	"	Of filling back of wharves, at.	0 4 0	30 0 0
220	"	Metalling in surface wharf, at.	0 3 0	41 4 0
		Contingencies 10 per cent. ..	..	21 2 0
		Total.....		232 6 0

Taking this expenditure at Rs. 232 per lineal yard of wharfage and land produced, and the whole length of wharf and pier at 4,326 lineal yards, would require Rs. 10,03,632 to complete the whole project; and as the proceeds by the sale of the land that have been plotted would, at the low rate of 1 Rupee per square yard, realize Rs. 2,62,533, being equivalent to

26 per cent. upon the expenditure, &c. accruing to the Government by executing these proposed works, while at the same time they would be bestowing incalculable benefits to the country and its people.

It may be said that such great profits are only assumed, but it is an assuring fact, that if these works were at once commenced in a proper manner, the lands resumed and valued at this rate, and could be obtained by capitalist and merchants, that the whole of the building plots would at once be permanently taken up on the understanding only, that the Government themselves completed the undertaking as laid down.

This subject has been one of especial interest and study to me for more than three years, so that I have ventured to propose and plan the present proposal, as one of many, and the best that could be formed for the present and future wants of the port of Beitkul for many years to come.

THE PROPOSED TOWNSHIP OF FRERE-TOWN NEAR THE PORT OF BEITKUL.

While upon the subject of a description of the proposed Railway, and with it the proposal for the improvement of Beitkul harbour, it will not, I think, be

out of place to venture a few remarks upon what I consider should be done with reference to the formation of the intended new town, to be formed, and I trust successfully founded under your Excellency's Government, and which I would respectfully submit should, by its promoters and founders, be called Freretown. As it appears that no definite plan of action has yet been approved, for the purpose of enabling intending investors of capital to purchase land, and commence such operations that may be intended by the Government should be erected in such township.

The necessity and advantages of a primary and fixed plan, such as I am proposing, has not until a late period been appreciated in England, excepting at the new towns of Fleetwood, Lowestoft, Formby, and Birkdale, the two latter which I personally laid down and planned with reference to roads, squares, building plots, and drainage. It was there found that these arrangements being first definitely settled, the land divided into classes, and suitable building frontages designed for each class, whether as public and private offices, dwellings, hotels, or warehouses, that the applications for land were speedily made, and building operations commenced.

The present may not be too late in the day to propose for the consideration of the Government, the desirability of at once resuming all the lands in and about the villages of Beitkul and Koney, that have not been already especially taken up for building

purposes, sufficient to plan a convenient township as the Head Quarters of the district, suited say for the present and future wants of the Port to 15 or 20 years, with powers created by a Bill, to be passed by the Government to resume all such additional lands that may require to be brought within the said township.

The land so resumed in connexion with those sites already purchased, should, by some experienced person, be laid out as a general plan of drainage roads, squares, and building plots, to be considered by a Committee appointed for this purpose, and finally laid before the Government for their sanction and approval.

The land so plotted should be leased by the Government for 99 years, or sold outright at a certain number of years purchase, the Government granting a freehold title for all such lands so purchased, provided for by clause in the proposed resumption of land Bill, in what may be called the Township of Freretown.

The present holders of land, including the Manchester Cotton Company and others, merchants of Bombay, should, in consideration of their having purchased lands and invested capital for the benefit of the locality, and to the increased revenues of the Government, have a priority of claim, for such plots of land from the approved town plan as may be desirable to them, in consideration of the resumed lands taken for roads, &c. from land purchased by them.

After such arrangements as these have been made, it would be advisable that the plan of the township be lithographed in England, and copies issued to the public and merchants' offices, and Exchange Rooms both in England and India; the designs of all frontages should also be deposited in the Town Engineer's office (to be hereafter appointed), to be seen at any time by intended purchasers of land, and copies obtained by investors upon payment.

The question of drainage should be of primary importance, and a perfect outlet for the whole of the future drainage of the new town should at first be decided upon, and the general drainage plan laid out in connexion with the principal roads.

Upon the approval of the general plan of the town, the building plots and roads should be fenced, in a similar manner to the revised laying-out of the new town of Rangoon, with a board attached to such plots that may have been purchased.

The roads required for the accommodation of the town and in connection with the port should be constructed by the Town Engineer at the expense of the Government, the expense of such road being defrayed or refunded to the Government by the purchasers of the plots of land on each side, the cost of such road being at a fixed rate per square yard according to class, and the locality of the intended town in which they are constructed.

Upon the commencement of building operations, the construction of roads, drains, &c. and with an influx of European merchants, traders, &c. a Municipal Council of the principal residents, Europeans and Natives, should be formed to superintend and take into consideration the question of the sale and leasing of the land, construction of roads, or other works that would of course be required.

The Town Engineer should in all cases submit all plans, applications for land, estimates for roads, drains, or other works required, for the approval and sanction of the Municipal Council, say up to Rs. 5,000. Any works involving an expenditure greater than this amount, should be first approved by the local Council, and finally submitted to the Government for their sanction, prior to these works being executed.

Such arrangements as I have proposed, though naturally crude, would, I apprehend, be sufficient to at once give an impetus to the intended and proposed township of Freretown; and in the event of a definite plan being at once laid down as I have ventured to suggest with a stipulation that building operations should be commenced within a certain date after such land has been taken up, I feel assured that but little time would be permitted to elapse ere the busy sound of the hammer would be heard, and buildings of numerous kinds would rise up on every side. The present cry is—no land, no title; and I have been in-

formed that a firm at Belgaum have for the last twelve months been using their best endeavours to obtain land in the vicinity of Beikul for the purpose of erecting an hotel, but in vain ; a deadlock of circumlocation seems to have reached even this inaccessible place, and no arrangements can be made, no definite information obtained in any quarter. Investors are ready, capital is at rest, and the pioneers of this to be flourishing port are, at the present time, located like the squatters in the backwoods and dense forests of Northern America, or the locations of an Australasian canvass town ; the general complaint that prevents progress being that no definite plan is laid down, no one appearing to know the quarter that progress will set in. Warehouses, offices, godowns, dwelling-houses, public buildings, shops, hotels, and cotton presses, would, in the course of a few years, be erected, if this unseen and unknown incubus that prevents this germ of a town, and one of the best ports in India, taking life and growing into its natural existence. Remove this by adopting the simple measures I have ventured to propose, and a trade would at an astonishing early period be established ; a great influx of European and Native traders would introduce themselves ; ships and country craft would adorn the capacious and beautiful bay, while the wharves at Beikul would be crowded with boats, barges, and lighters, with busy men working amongst the most absorbing and important product

of the day, shipping cotton and landing all the multifarious kinds of goods required for a young and growing community on the spot, and more than three millions of souls at its back, whose comforts and happiness would increase and grow as the out-port gives them what they require for their daily existence, and takes away from them the commodity that they grow, for the tens of thousands of bread winners in England. When Freretown and Beitkul must become the New Orleans of the East, but allied closer to every interest both in India and England, by its being in our own dominions.

It has only been up to the present time that this huge something has existed; call it "Nemo" or by any other name that effectually stops the way, it has not been a passable obstacle, because this could have been seen and removed; it has not certainly been opposition, for all are intent in mind and will that the port must be opened; it has been a combined something, of which every department that has had to do with the place have created a part, and paralysing the action that tends to its progress, and the simple path to ensure the prosperity of the port of Beitkul cannot be followed till this unseen obstruction is removed and a fixed plan of operations determined upon. The acts are broad and true, that the difficulties of obtaining land in any place and in any quantity cannot at the present time, and under the present system, be surmounted. The pioneers of this place of importance

are in their uncertainties located in grass chupper built huts, while their properties and stock are lying unremunerative in sheds of palmyra leaf and a few rotting jungle-wood sticks. Not a brick can be laid, nor a stone quarried from its bed, or rafter or beam lifted to its permanent and lasting place, because this *something* stops the way preventing progress; preventing the investment of capital; preventing the port being opened; preventing ships approaching it; preventing the prosperity and increased comforts to the proposed town and the people surrounding it; preventing improved communication to more than three millions of people at its back; and preventing increased revenues from flowing into the coffers of the Government. All these serious evils, these many obstacles, would at once be removed by the adoption of such a course of action that I have ventured at to introduce the end of this paper.*

* Since the above has been in type, I have had an opportunity of perusing the extract from the proceedings of the Government in the Revenue Department, No. 3893, of October 27th, 1862, and see no reason to alter any suggestion I have made with reference to the proposed new Town. The transfer of the energetic spirit of Dr. Forbes to Sedashegur speaks much of the intentions and wishes of the Government on the subject; but there is wanting a practical and professional view of the whole question in the instructions issued, and the Provisional Committee so constituted is a surrounding of those departmental drawbacks which will I fear keep Feretown and Beitkul in their present state for a long time to come.

APPENDIX.

SEDASHEGUR.

From GEORGE LATHAM, Esq., C. E.,
 Resident Engineer North-West Line, M. R.,
 To Col. Commandant H. B. TURNER, Engineer,
 Acting Chief Engineer & Secretary to Govern-
 ment, Department of Public Works, Bombay.

SIR,—Having perused a copy of the 8th and final report from Commander Frazer upon the Bay of Sedashegur, dated the 21st of November—

2. I have the honour to forward you, enclosed, a tracing of a plan of the bay of Sedashegur, showing how that bay can be formed into a very safe harbour, with dock and wharfing accommodation, which, if eventually constructed, would render the port of Sedashegur one of the most safe, roomy, and convenient that this country possesses.

3. The subject of the formation of a harbour of safety and refuge at Sedashegur has now occupied my attention for a considerable period, and the general plan now enclosed is the result of close and varied observations made upon it, more especially with reference to comparative safety during the period of the the SW. Monsoons; and with a view of arranging the whole into one complete work, rather than adopt and plan minor suggestions to meet only the wants of the present time and trade,

and which might, upon the anticipated development of trade in the port, afterwards be found to be both inconvenient and inadequate to the demands made upon it.

4. With these views, the proposed works are divided into sections, which form in themselves complete portions in part of the general design.

5. The following are the different sections as shown:—

Section 1.—The south mole and portion of quay wall inward.

Section 2.—Quay walls, Carwar dock, basin and pier, with roads and buildings.

Section 3.—Quay walls, boat basin, and buildings.

Section 4.—Quay walls, wet docks, graving docks, sheds, buildings, &c., being works included in the area of Beitkul Cove.

Section 5.—Quay walls, recovery of wharfage accommodation, and the iron pile pier fronting the proposed railway station.

Section 6.—Outer break-water, outside harbour.

Section 7.—Northern mole of harbour from Deoghur island seawards.

Section 8.—Northern break-water from Deoghur island landward; of the same construction as the outer break-water.

Section 9.—Protective river works on the Cauly Nuddee, with reclamation embankments.

6. The existence of the line of breakers caused by the reflux of the pent-up waters in the northern angle of the bay between Deoghur and Comaghur island and the mainland, in addition to the outflow of the Cauly Nuddee, would at once be neutralized by the construction of the south mole outwards from Carwar Head, forming Section 1 on the plan. In

forming this, I propose to use the material of Carwar Head itself, recovering wharfage from it, and erecting sea walls from each of the projecting points of the cliff into the bay. This would give a roadway on to this pier of 150 feet wide, and wharfs of 60 feet in width, with landing slips on the inside of the mole and along the wharfs. The curved form has been proposed as best to meet the impinging forces of the water during the SW. Monsoons sent against the bluff point of Carwar Head, and being the best line to divert them outwards and northwards from the safe anchorage ground inside this proposed mole, and under Carwar Head.

7. The breakers mentioned by Captain Frazer arise chiefly by the opposition of the two forces, one proceeding from the sea, and the other by the outflow of the Cauly Nuddee and the enclosed waters from the sea in the north-eastern angle of the bay, and may be distinguished by the term of chopping waves, being a surface agitation outside the bay kept up only during the prevalence of the SW. winds.

8. It appears evident that the running sea into the bay of Sedashegur is caused chiefly by the long prevailing SW. winds, and causing what would otherwise be waves of alternate elevations and depressions into long running waves, possessing immense force by their movement of translation.

9. With this body of water driven before the SW. winds, and from the prevailing southern pacific current, diverted from its progressive course into the north-eastern part of the bay, the reflux mentioned by Commander Frazer would be so far overcome; and by forming protective works at the mouth of the Cauly Nuddee, the outflow from this river would then act as a natural scour for the inner

and lower sides of the harbour, its exit being the two entrances of the harbour north and south. Groines should also be constructed along the low shore from north to south of the bay, to intercept the silt and ooze before reaching Beitkul Cove.

10. In this general plan I have shown the principal lighthouse to be on Carwar Head. Commander Frazer, however, suggests that it should be erected on the largest of the oyster rocks, as being less liable to be obscured by low lying clouds than it otherwise would be if erected on Carwar Head. As regards the cost of such a lighthouse, if erected on the oyster rocks, requiring as it would, to be carried to a much higher elevation than on Carwar Head, and in consequence of being off the land, would cost considerably more than a lighthouse 60 feet high on Carwar, and which latter could also be made a flag-staff station for telegraphy. This light on Carwar Head would only require to be 60 feet in height to obtain a light 700 feet above sea level. But if such a light would be safer to navigation erected on the oyster rocks, then the matter of additional cost should not, I think, altogether affect the question of perfect security to ships.

11. Harbour buoys are proposed to be erected at the termination of the north and south moles.

12. I regret that time does not permit me to send you details of the different sections as shown on this general plan, as I am preparing to visit Sedashegur prior to my leaving for England, and laying the project before the Government of Bombay; but as these refer especially to the practical carrying out of the different sections in an engineering point, I trust you will excuse the present omission.

13. Sections 2 and 3 comprise the erection of a sea wall from the two extreme projecting points of the cliff, and on the eastern point forming a landing pier, called the Carwar Dock Pier on the plan. The face rock cleared at this point, as also the area recovered by the sea wall, pier works, and filling, would give roadway, wharfage, and building accommodation to 650 feet in width. Section 2 crosses the greatest indent into Carwar Head, and I propose that in this a wet dock should be constructed 800 feet by 250, entered by a basin 400 feet by 250 feet. The depth of water obtained over the silt of the outer gates would be 22 feet.

14. This dock and basin (called on the plan Carwar Dock and Basin) could be enclosed by a wall giving 100 feet in width of wharfage between the dock and the harbour, with 150 feet between the dock and the shed walls on the southern side, and with a roadway 60 feet along the back, leading to the buildings to the west and the southern mole and 160 feet roadway at each end. To the east of this dock and basin, roomy accommodation for office buildings, warehouse, and roads could be obtained between it and the proposed boat and lighter basin in Section 3, constructed in the other indent of the Carwar Head. This boat basin could be 600 feet long and 250 wide, with slips for landing passengers and cargo at each indented angle, with a line of warehouses along the back and roadways of considerable width. These roadways, round this basin should be open to general traffic, similar to the dock basins at Liverpool and Birkenhead, and which are chiefly used for lighter and fishing craft; the portion of the sea wall between Carwar dock and basin and the boat basin would be projected into the harbour

so as to give landing slips at each end, and a roadway in front 180 feet wide.

15. The dock sheds proposed along the inside of the boundary walls of the Carwar dock and basin should be open structures on iron columns, supporting iron roofs 50 feet in width. There are eight entrances shown to this dock and basin, with gatekeeper's lodges at each, and the dock offices at the eastern end.

16. The 4th Section includes the works intended to convert the whole of the land and wash occupied by Beikul Cove into dockage, &c. including six wet docks, one wet dock being used as a repairing dock, and two graving docks. The sheds inside enclosures of docks comprise goods sheds, shipwrights' sheds, stores, and outside roadways and building plots for offices, warehouses, or buildings otherwise adapted and required at a large port; as also a dock railway depôt from the main line of an intended projected railway from Sedashegur into Dharwar and on to Bellary. This portion, comprising so much in the general design, would be the most important, not only in a commercial sense in enabling ships to enter the docks and discharge or receive their cargoes, but would also give them accommodation for repairing and refitting in the inner docks proposed to be constructed. The front line of these intended works would extend across the mouth of Beikull Cove, from the rounded and elevated portion of land that encloses this *cul-de-sac*, and with these outside works completed, the whole of the interior arrangements could be easily and safely carried out. The front to the harbour of this section extends for 3,000 feet, the centre portion projected into the harbour to extend the wharfage accommodations and provide landing slips at each

termination. The extreme western dock in this section would be 800 by 400 feet, with an entrance from the harbour, and a leading entrance into the next dock to it, which would be 800 feet by 300 feet. The wharfage between these two would be 250 feet in width, with open sheds for goods, &c.

17. The eastern dock in the south-east angle of the harbour should also be entered by gates from the latter, and could be 800 by 500 feet, entering into another dock 800 by 300 feet. These four docks would form a double pair of docks, the eastern and western being main docks, with annexé docks on each side. The space between the annexé docks would be 400 feet, with a division wall dividing the pairs and open sheds along each side.

18. The proposed entrances to the east and west docks are 80 feet in width, suitable to admit the largest ships afloat, and with 20 to 22 feet of water over the sill at high water. These could either be filled with caissons the same as at Keyham, or swinging gates, which latter, for so large an entrance, should be made of metal as at Sevastapol.

19. These four wet docks next the harbour are altogether enclosed with walls, on the inside of which open sheds of different lengths are proposed, making a total of about 5,500 lineal feet in the whole, having eight entrances with gatemens' lodges.

20. From the south end of the western dock is an entrance to the inner dock 1,200 feet long by 400 feet wide, (called on the plan Beitkul Dock,) the entrance of which is crossed by a turn bridge, as it is one of the main roads to the western portion of the harbour and wharves. This dock is enclosed by walls, sheds, and warehouses; on the west side, the main road, as proposed, continues along the western side of this dock and round the eastern

bluff of Carwar Head, continuing round Beitzkul Cove to the open land facing the harbour westward. The principal roads are proposed to be 160 feet and 130 feet wide, both in this and the other sections of the designs.

21. To the south of the inner dock, is the entrance to the repairing dock (marked on the plan as Cove Dock), also crossed by a turn bridge as it would be a principal road. This repairing dock is shown to be 800 feet long by 400 feet wide, enclosed with shipwrights' sheds along the whole of its west side, and on the east side are the intended entrances into two proposed graving docks, enclosed from the two ends of the repairing dock, and containing ample wharfage and working room, shipwrights' sheds, store houses, engine houses, &c. These two graving docks could be pumped dry into the repairing dock entrances. The roadway continues all round these graving docks, the principal entrance being on the west side and opposite the railway dock station.

22. On the high ground at the south and south-east of these docks I have laid out in plots of building ground which could be formed and intersected by open and convenient roadways. These sites would of course be of immense value to the Government upon the commencement of any operations at this port that would give security to shipping and increase its trade.

23. Section 5 comprises the erection of a sea wall into harbour, to ensure 14 feet in depth of water at its side, and from this an iron pile pier should be erected, having an open roadway down the centre of 25 feet in width, with a line of railway on each side terminating in a cross head 1,400 feet in length, having cranes and the necessary hoisting

apparatus, and slips for loading and discharging cargo. The piles could be either Mitchell's screw pile or the pneumatic disc-pile.

24. This pier and the portion of sea wall forming Section 5 should, I think, be constructed by the proposed Railway Company, to land all their own material, as well as to discharge and load all other kinds of goods at certain rates per ton, called *pier dues*, that could be arranged by the Company and the Government, in the event of the former being formed to carry out such a desired project.

25. The 6th Section comprises the most costly and most difficult work in the present design, being the outer breakwater facing the entrance of the harbour from north to south, consisting of a centre portion with two arms slightly bending inward towards the proposed entrances north and south, making the south entrance to the harbour 2,000 feet in width, with 1,750 feet open to the SW., while the northern entrance would be 2,400 feet. This breakwater, constructed in 34 feet depth of water, not only confines the limits of the harbour outside, but acts as a protection to the inner roads from violent gales from the west, as well as receiving a considerable portion of the water driven forward by the SW. Monsoon, and diverted in a northerly direction from it, betwewn itself and the eastern extremity of the oyster rocks. It will, I trust, appear clear to you, that with this work, and the southern mole erected, that the whole force of the SW. Monsoon would be diverted from its present course, and that it could not reach the north-east angle of the bay, while the force of the out-flow of the Cauly Nuddee would be brought to bear independently into the harbour itself, and aid in effecting a scour out of it, after traversing the

lower area in a northerly direction during the SW. Monsoons. The silt and ooze being in a state of partial suspension, would easily be ejected from the harbour by the agitation of the sea serving to maintain the depth of water.

26. This breakwater is intended to be constructed of huge masses of rough rubble stone, and continued about 3 feet above the highest spring tides, the total length of which is 1,833 yards, and is only intended to be constructed as designed when the trade and importance of the port has extended to such a point as would justify such a large expenditure.

27. Section 7 comprises the works continued in the construction of the northern mole from Deoghur Island into the sea, and is proposed to be of the same construction as the southern mole, with a buo light at its termination to mark the northern entrance. The length of this mole is 666 yards, continued into 27 feet in depth of water.

28. Section 8 is the northern breakwater of rubble, of the same construction as the outer breakwater (Section 6), continuing from Deoghur Island, and inclining southerly, so that its termination should be opposite the south groine of the entrance of the Cauly Nuddee. The object of this is to increase the extent of anchorage ground under it during the prevailing NW. winds, and to divert the current from the north during these winds, which, with the outfall of the Cauly Nuddee directed in a southern direction along the low shore of the harbour, and along the southern side under Carwar Head, would tend materially to keeping the harbour clear of silt, which otherwise might be detained by the want of a sufficient force to move the impediment forward and outward during the time that a great deal of it will be in a state of suspension.

29. It would be impossible to suppose that this harbour would be perfectly clear of the many obstacles that have generally been found to accumulate in and about enclosed harbours; but from its natural position and formation, and the many advantages it possesses, I am of opinion that, by its construction under the proposed design, it would be partially free from the formation of bars, banks, or silting. The entrances open to the NW. and SW. would in all seasons prevent any outside bar from forming, so as to effect the entrance into the harbour, by the prevailing winds into the harbour being from these two points at the different seasons of the year. I should also consider that the outfall from the Cauly Nuddee, with the protective river works constructed, so as to confine its exit and increase its force, combined with the flowing of the NW. currents from the great fetch of the sea from Loliem Point, and converted by the northern breakwater inward from Deoghur island, that the harbour could be kept all but clear of silt, and that the present depth of water would not be materially affected.

30. Beyond the protective works at the entrance of the Cauly Nuddee, forming Section 9, and the position of its entrance with reference to the harbour, I have not had sufficient time to give the groines and protective works along the low shore a sufficient amount of consideration and study, and I preferred to wait before planning any decisive works upon this portion till I have again visited and personally examined the port.

31. In forming such an extensive design, so as to form the whole into one complete and perfect work, I have done so only on the belief that, when the trade of the port of Sedashegur commences to expand under the new impetus of trade given to the

principal staple of the country adjacent to it, the demands made upon it will be so great, that such works as I have laid down will in the future become absolutely necessary to meet its commercial prosperity; that in the event of such anticipated prosperity, the proximity of its vast forests of serviceable timber for ship-building purposes will soon bring this trade also to a very high state of perfection if the necessary accommodation is arranged to meet its wants.

32. The chief want however of the harbour is a pier for loading and discharging goods in a safe and expeditious manner, and the iron pile pier, forming part of Section 5 should at once be constructed, either by the Government or by a private Company. The next would be the works forming Section 1, so as to increase the area of the safe anchorage during the SW. Monsoons. With these works, together with the lighthouse either on Carwar Head or the oyster rocks, the port would have received the first of its great wants, which, when supplied, would, by the anticipated increase of tonnage entering the harbour, demand that wet and dry dock accommodation should also be provided.

33. Such extensive works as these, forming as they do aids to the increase of commerce, should, I also think, be constructed by a private company, with a capital to construct certain required sections of the works most important to the present trade of the port, and with power to increase such capital account for the construction and completion of other sections.

34. I have not made any communication to the Government as yet with reference to this important subject, not having completed my detailed plans of the different sections; but as Commander Frazer's report had already been received by Government, I

considered it advisable to put you in possession of the present design, and to communicate my explanation of it at as early a period as possible.

35. It is a matter of regret that so many adverse reports have been made upon the bay of Sedashegur, having reference only to the worst seasons of the year, which is generally supposed to exist only for a period of about two months, and made upon the natural state of the bay without reference to the security that would be afforded by the construction of works tending to decrease the evils to which, in its present state, it is subjected.

36. While in other cases the opinions of masters of ships, who have made the bay in all kinds of weather, pronounce that the difficulties are not more than would otherwise exist in any open or exposed situation in bad weather.

37. Again I would remark that, with reference to some of the English harbours, no opinion could possibly have been favourable to either Milford Haven or Holyhead, if commanders of ships were to report upon their capabilities, and to make them during the periodical storms that rage through the English Channel and before protective works had been constructed; and the same remarks might equally be applied to all the open coast harbours along the western coast of England.

38. During the very violent gales that occur at different periods of the SW. Monsoons, ships would no doubt prefer to keep at sea rather than venture too near the land in the hopes of making the harbour, or if forewarned of such storms by a sudden falling of their barometers, they would, without doubt, be able, with the steady prevailing SW. winds, to make the harbour and be under shelter before it burst; while all outward-bound ships would keep to

their moorings inside, until such favourable opportunities occurred that would enable them to make their exit by the northern entrance; and in this they could at any time be assisted, if required, by a powerful steam tug, that would find sufficient work in the harbour at all times. She could also be employed to go outside the harbour and bring in ships upon being signalled that she was required.

39. Commander Frazer's report may, however, be considered to be favourable to the position, as he suggests that a breakwater should be constructed, and these suggestions are, I would venture to suggest, sufficient to prove that, with the proposed constructed works, the harbour could be rendered one that would give the greatest security to shipping; that it is impossible to realize the commercial value of the port when measures are taken to give to ships some accommodation in loading and discharging their cargoes, that the benefits to the Bombay Government by the acquisition of such a port and the sale of building land will be immense, and that it will possess a rival to Bombay that will soon, by its rapid growth, share its prosperity and trade.

40. That its vicinity to the ghauts will be a great inducement to English capitalists in taking up land for the growth of coffee, while the revenues for the timber in its forests will be greatly increased; that with the completion of the Kygah Ghaut road or the construction of an economical line of railway, that it would receive the whole of the cotton trade of Dharwar, Belgaum, and Bellary, besides the other export commodities of these districts, and from its great area of 21,152 acres, would certainly entitle it to be considered the first port in the eastern seas.

41. Should the Government be prepared to construct such works as are absolutely required to advance the present interest of the port, by the construction of an iron pile pier to enable vessels to load and discharge their cargo with convenience and without the present risk, I would respectfully venture to suggest the construction of another pier for their consideration, in a more northerly position than the pile pier shown on the plan, to be constructed with teak piles driven closely together, obtained from the adjacent forest, and carried out to about 12 feet depth of water with side slips in 8 feet water, the pier to be 20 feet wide filled with concreted rubble. The advantage to be derived from such a construction would be the saving of considerable time, and the securing a landing pier for next season's exports during the time the more permanent structure was being constructed. Such a pier as this would last at least 20 years, and could then be renewed by again piling round the outside, or sheeted with cast-iron plates in grooved iron piles. It could also be rapidly constructed by using a steam pile driver and working outwards, the fitted to follow up the piling as rapidly as possible; and to meet the present trade, lines of rails could be laid along this pier connected with the depôts or stations on shore.

42. I suggest this mode of securing a pier at an earlier stage in the harbour of Sedashegur, by the fact of my having driven a similar pier through the surf at Madras, and erected upon it large lifting shears for landing the heavy engines and tenders for the Madras railway.

43. From my experience in cutting timber in the Nuggur forests, I apprehend that there would not be any difficulty in getting timber down the Cauly

Nuddee; and the necessary iron work, rails, plant, &c. could be obtained from Bombay.

44. Should you think it advisable to lay the present letter and the plan enclosed before the Government of Bombay, I shall be glad by your so doing, as prefacing my fuller report and detailed plans which I shall do myself the honour to lay before them when fully matured, together with the estimates of the different sections.

45. These will, however, occupy me some time after I reach England, and will be forwarded from thence.

I have the honour to be, &c.,

(Signed) GEO. LATHAM.

No. 472 OF 1862.

Public Works Department.

To G. LATHAM, Esq., C. E.,

Resident Engineer N. W. Line, M. R.

SIR,—I have the honour to acknowledge the receipt of your letter, dated the 21st instant, and of a report and tracing relating to the harbour of Sedashegur.

2. Having submitted the documents to His Excellency the Governor in Council, I am directed to convey to you his thanks for the trouble you have taken in the matter, and to inform you that as it has been determined to employ the officers of this Government to do all that is at present intended

to undertake, Government cannot accept the offer of your services.

I have the honour to be, &c.,

H. B. TURNER, Col. Comdt.,

Acting Chief Engineer and Secretary to Govt.

Bombay Castle, 27th January.

DUE DATE
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